



Imperial Bureau of Plant Breeding and Genetics

Plant Breeding Abstracts

Vol. XI, No. 2.

(Abstracts Nos 242—496)

School of Agriculture
Cambridge
England

1st April, 1941.

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Note.—Initialled abstracts are written by the following:

Dr S. Dickinson	S. D.
Dr H. O. Hartley	H. O. H.
Mrs R. M. Ingham	R. M. I.

* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. XI, No. 2.

Part 1. Empire Section

STATISTICS 519

242. BEALL, G. 519.24
The technique of randomization in field work.
Canad. Ent. 1940 : 72 : 45-51.

The use of Tippett's random sampling numbers is explained.

243. YATES, F. 519.24
Lattice squares.
J. Agric. Sci. 1940 : 30 : 672-87.

This paper gives a new method of statistical analysis of an experimental design called "lattice squares" or "quasi-Latin squares". With this design (first described by the author in a previous paper reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 317) the number of varieties tested must be the square of an integer (i.e. 4, 9, 16, 25, etc.) and the design consists of a number of Latin squares serving as blocks with the plots in each block arranged in a square pattern to which the varieties are allotted by a scheme known to statisticians as orthogonal squares. With the method of analysis described previously differences between the yields of rows and columns were completely eliminated from the varietal comparisons, resulting in a loss of information in cases where the actual fertility differences between rows and columns are small. In this paper the author describes a more flexible analysis with the help of which this loss of information is "recovered".
H. O. H.

244. MAHALANOBIS, P. C. (Editor) 519.24(54)
Proceedings of the Second Session of the Indian Statistical Conference held in Lahore, January 1939.
Statist. Publ. Soc. Calcutta 1940 : Pp. 168.

In view of the important part played by India in the birth of mathematics and of the complex problems arising in the government of a country with such a vast population, it is not surprising that the science of statistics has reached such a high degree of development in India. This is well illustrated by this conference report.

The papers of direct interest to plant breeders have already been reviewed from another source (cf. "Plant Breeding Abstracts", Vol. XI, Absts 2, 5 and 7). Two papers of more general interest are reviewed below:—

- Mahalanobis, P. C. *A sample survey of the acreage under jute in Bengal.*
(pp. 73-92).
(also Sankhyā: Indian J. Statist. 1940 : 4 : 511-30.)

This paper deals with recent sampling methods to estimate the acreage under jute in Bengal. Such estimates are to be combined with corresponding data for the estimated "yield per acre" to produce annual jute forecasts for Bengal.

Whilst for the estimation of acreage under home crop (see J. O. Irwin, J. R. Statist. Soc. Suppl. 1938 : 5 : 1-45) the Government is able to rely to a large extent on the reports given by the official crop recorders, such a procedure would, according to the author, be unsatisfactory for jute forecasts in Bengal.

The principle of the sampling method which the author puts forward as a suggestion for an improved technique, is to divide Bengal into homogeneous zones, so that in each zone the proportion of the acreage under jute is approximately constant. To estimate this proportion, a number of sample-areas (called grids) distributed at random over the zone, are surveyed in detail, and the average sampled proportion of "jute acreage" thus obtained is then multiplied by the known acreage of the zone.

The problem then consists in determining the best size and density of the sample areas. To this end, a small scale experimental crop census was carried out, and for varying size and density of the sample-areas, the sampling error was determined. With most sampling surveys

of this nature the assumption is made that the cost of the survey is proportional to the total area sampled, and the requirements for the best "size" and "density" are that the sampling error per unit area should be at a minimum. In this paper, however, the question of the cost of the field work of the survey is considered in detail, and its dependence on such items as journeys and expenses of the field staff, time spent in inspection, etc., is considered. With the help of what is called the cost function (which is determined experimentally) the author is able to derive for any given cost (which it is proposed to spend on the survey) that size and density of the sampling units which yield the smallest sampling error. The results naturally depend on the "cost function", and it can hardly be expected that this function will be stable from district to district or from year to year. This limits the applicability of the conclusions reached.

H. O. H.

Nair, K. R.

Table of confidence interval for the median in samples from any continuous population. (pp. 113-20).

Although the arithmetic mean of a sample is the best known average of observations, it is, at times, preferable to replace it by a statistic called the median. There is a difference in the definition of the median according as the number of observations is odd or even. For instance if 5 observations are arranged in order of magnitude the median is the value of the third observation. If, however, there are 6 observations the median is defined as the value midway between the third and fourth.

Just as the reliability of the mean is measured by its standard deviation the reliability of the median has to be determined. This paper is a contribution to this problem and the author provides tables with the help of which tests of significance, well known as applied to means, may be carried out for medians.

H. O. H.

245. NAIR, K. R.

519.24:631.421

The application of co-variance technique to field experiments with mixed-up yields.

Sci. and Cult. 1939 : 4 : p. 474.

A method is outlined of applying the co-variance technique to determine the yields of a number of plots in a field trial when their individual yields have got confused (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 5).

246. HUDSON, H. G.

519.24:631.421:633.11-1.557

Population studies with wheat. III. Seed rates in nursery trials and field plots.

J. Agric. Sci. 1941 : 31 : 138-44.

Studies of unit drill lengths in field plots of wheat have shown that yield per unit length is correlated with number of plants per unit length and suggest that the areas of low plant density which occur in wheat fields cause a considerable loss in yield. On the other hand this conclusion is not confirmed by direct seed rate tests in nursery plots where the seeds are sown evenly. The discrepancies between the two types of result can be attributed to differences in intensities of external competition, the greater the intensity the lower the yield. In nursery plots each unit is surrounded by units of a similar density so that low plant densities have low competition and high plant densities have high competition. In field trials, areas of high plant density have medium (or average) external competition and so would be expected to have higher yields than areas of similar plant density in nursery plots where external competition is high; similarly areas of low plant density in field trials also have medium competition and so would be expected to yield less than similar units of comparable plant density in a nursery plot. Graphs are given showing the variation in yield per unit drill length with number of plants per unit length for several intensities of external competition. They show that the intensity of external competition has a large effect on yield and that, whereas the optimum plant density appears to be over 20 plants per unit drill length from the field data, the true optimum is about 9 plants per unit length. A seed rate curve is also given and this shows that the yield only decreases slightly with quite large deviations from the optimum seed rate. It is also suggested that since competition is primarily for water and secondarily for soil nutriment, the drier the climate and the poorer the soil the more intense will be the competition and the lower will be the optimum seed rate. A survey of the literature concerning seed rates of wheat in different parts of the world confirms this suggestion.

247. VAIDYANATHAN, M. and
SUBRAMONIA IYER, S. 519.24:631.421:633.61
**A note on the analysis of 3^3 and 3^4 designs (with three factor inter-
actions confounded) in field experiments in agriculture.**
Indian J. Agric. Sci. 1940 : 10 : 213-36.

In this paper the authors deal with two modern designs of field experiments described by Yates in Technical Communication No. 35 of the Imperial Bureau of Soil Science. The object of their note is to "explain fully the computations involved in the analysis of such designs so that they may be easily understood by the agricultural experimenter in India". Data from an experiment on sugar cane carried out at Shahjahanpur during 1938-9 are used to demonstrate the analysis of a partially confounded 3^3 design in which three different methods of interculture were tested at three different levels of nitrogen manure with the number of irrigations varying between 2 and 6. To demonstrate the analysis of a confounded or partially confounded 3^4 design data from a real experiment were not available and the results of a uniformity trial with dummy treatments superimposed had to be used for the purpose.

H. O. H.

BREEDING 575

248. MILES, L. G. 575:633
Plant-breeding and the production of better seed.
Qd Agric. J. 1940 : 54 : 258-67.

A brief popular account.

249. **Progress of agriculture in India.** 575:633(54)
Sci. and Cult. 1938 : 3 : p. 431.

In a broadcast lecture from Delhi Sir Bryce Burt mentioned, among other things, that there are 83 plant breeding stations in India, that breeding work is in progress on 30 major crops and that improved varieties of crops occupy some 25,000,000 acres.

250. SARUP, S. 575:633(54)
A review of the plant hybridizing work done in India.
Sci. and Cult. 1938 : 3 : 422-25.

A brief review of past and present breeding work in India on wheat, rice, oats, sorghum, sugar cane, cotton, tobacco, groundnut, barley and linseed.

GENETICS 575.1

251. Prof. E. W. MacBride, F.R.S. 575.3:007
Nature, Lond. 1940 : 146 : 831-32.

In this obituary notice MacBride's belief in the inheritance of acquired characters is among the aspects of his work described.

252. MATHER, K. 575.42
Variation and selection of polygenic characters.
J. Genet. 1941 : 41 : 159-93.

The attention of plant breeders is drawn to this paper on selection in hybrid progenies of *Drosophila melanogaster*. Briefly the author finds that change in response to selection occurs in two stages, the first due to recombination of whole chromosomes, the second to recombination of parts of chromosomes by crossing-over. He infers the existence of balanced polygenic combinations developed by natural selection.

CYTOLOGY 576.3

253. DARLINGTON, C. D. 576.312:1
Mind and Matter.
Nature, Lond. 1940 : 146 : p. 808.

Replying ironically to a book review in which it was stated "that mind and not matter rules the earth", the author shows the dilemma created by a belief in this principle for the cytologist, who by his work is led to believe that chromosomes, material bodies, govern the type of, and even the possession of, the mind of a human being.

254. BISWAS, K. 58.006(54.1)
The Royal Botanic Garden, Calcutta.
 Sci. and Cult. 1940 : 6 : 26-33.

In this account of the history and work of the Royal Botanic Garden, Calcutta, the part it has played in surveying the botanical wealth of India and neighbouring lands and in the introduction of economic plants is shown.

255. MAHESHWARI, P. 581.163:577.17
The rôle of growth hormones in the production of seedless fruits.
 Sci. and Cult. 1940 : 6 : 85-89.

Reviewing the topic historically the author shows that it has long been known that agents incapable of achieving fertilization, such as foreign, immature, aged or dead pollen could induce parthenocarpy. When it was shown that an extract of pollen would do the same it was evident that the stimulus was a chemical one and more recently (1936-37) it has been found that growth substances have the property of inducing parthenocarpy. The application of the technique to tropical fruits should provide interesting problems and results.

PLANT DISEASES 632

256. JOHNSON, T. and
 NEWTON, M. 632.452:575.11:633.11
Mendelian inheritance of certain pathogenic characters of *Puccinia graminis Tritic*.
 Canad. J. Res. 1940 : 18 : Sect. C : 599-611.

The inheritance of the capacity for producing a given type of infection on certain wheat varieties was studied in the F_1 and F_2 (produced by selfing the F_1) of crosses between different physiological races of *P. graminis Tritic*. The "O" type of infection on Kanred (absence of rust pustules) was dominant over the "4" type (large rust pustules) and 3:1 ratios were obtained in F_2 . The "4" type infection on Mindum (*Triticum durum*) was almost always dominant over the "1" type (very small pustules) and here also 3:1 ratios were obtained in F_2 . The "1" type of infection on Vernal (*T. dicoccum*) was dominant over the "4" type and a 15:1 ratio was obtained in F_2 . Maternal inheritance governed the infection produced on Marquis by F_1 hybrids between races which produced different types of infection on this variety.

Evidence was obtained from two crosses between races 9 and 36 that the genes governing infection types on Kanred, Mindum and Vernal were inherited independently.

ECONOMIC PLANTS 633

257. GOODWIN, A. J. H. 633:576.16(68)
The origins of certain African food-plants.
 S. Afr. J. Sci. 1939 : 36 : 445-63.

In this essay, Vavilov's work on the origins of food plants is considered in its bearings on African plants. The conclusions of ethno-botanists and ethnologists are also historically and critically examined and a table is drawn up showing the author's conclusions on (1) the origin of large numbers of African plants—Gramineae, root crops, legumes, Cucurbitaceae, Palmae, narcotic and stimulant plants and other miscellaneous food plants; and (2) the channel through which plants not indigenous reached the African continent. Migration is discussed from the ethno-botanical aspect.

WHEAT 633.11

258. HORE, H. L.,
 SIMS, H. J. and
 WEBB, C. G. 633.11:575(94.5)
Mallee Research Station.
Experiments and results.
 J. Dep. Agric. Vict. 1940 : 38 : 523-32, 552-59.

A brief account is given of the wheat breeding work of the station. An improved selection of Sword, known as Rapier, is under test. Magnet, a selection from Major x Free Gallipoli, has given the best yields of the late maturing varieties over three years; seed of this variety

is available for the Wimmera only. Several new cross-bred selections appear to combine high yield with quality, the best being Ghurka x Ranee M5174, Major x Ranee W6021 and Currawa x Ranee M6029.

259. HARRINGTON, J. B. 633.11:575.125:575
Yielding capacity of wheat crosses as indicated by bulk hybrid tests.
 Canad. J. Res. 1940 : 18 : Sect. C : 578-84.

To test the hypothesis that heterosis, as shown in the yield of the early hybrid generations, is a true indication of the yield value of a cross, F_2 and F_3 bulk populations of several wheat crosses were grown with the parental varieties in replicated tests.

Of six crosses investigated in this way in 1932 and 1933 it was found that Reward x Hope showed most heterosis and in later years high-yielding lines were in fact selected from this cross. The crosses Quality x Ceres and Quality x Reward showed least heterosis and no lines superior in yielding capacity have been obtained from either cross.

In 1939 similar tests were carried out with four crosses using bulk F_2 material. Thatcher x Reliance is a cross between closely related varieties and showed no heterosis. In Bobs x Pioneer the relationship is geographically wide and considerable hybrid vigour was found. Mayview (*T. compactum*) x Apex is a cross between species of the same chromosome number and here again there was strong heterosis. Marquis x Black Persian (*T. persicum*) involves species of different chromosome number and the yield of the bulk F_2 was low, owing to sterility. In view of the earlier results it is to be expected that improvement in yield will be most readily obtained from Bobs x Pioneer and Mayview x Apex.

Discussing the results the author points out that yield is not the only problem in wheat breeding and also that more extensive work with more numerous crosses and with other crops is needed before the value of bulk hybrid trials in assaying the yield value of crosses can be regarded as established.

260. TSITSIN, N. V. 633.11:575.127.5:633.289
Wheat and couch grass hybrids.
 Sci. and Cult. 1940 : 6 : 18-20.

Reference is made to the merits of various *Agropyron* species as parents (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 189) and to two promising *Triticum-Agropyron* hybrids. One, referred to as No. 34085, is perennial and has produced 7 to 8 crops of grain in three years, the annual grain yield being far in excess of that of the common wheat varieties. The ear is hard to thresh and bearded, the grains weighing 25 to 33 grm. per thousand. The plant is highly resistant to drought and tolerant of saline conditions.

No. 23086 is beardless, perennial and very cold-resistant and other numbers are said to be promising, some being immune to smut, some to rust and some possessed of extremely high baking quality.

261. NEWTON, M., 633.11-2.452-1.521.6
 JOHNSON, T. and 633.13-2.452-1.521.6
 PETURSON, B.
Seedling reactions of wheat varieties to stem rust and leaf rust and of oat varieties to stem rust and crown rust.
 Canad. J. Res. 1940 : 18 : Sect. C : 489-506.

The seedling resistance of a large number of wheat varieties to 20 physiological races of stem rust (*Puccinia graminis Tritici*) and to 8 races of leaf rust (*P. triticea*) was investigated. The seedling reactions of a large number of oat varieties to 11 races of stem rust (*P. graminis Avenae*) and to 9 races of crown rust (*P. coronata*) were also determined. The results are given in four large tables.

In the *vulgare* group, Eureka, McMurachy and five strains developed in Kenya were found to be seedling immune to the races of stem rust used at normal greenhouse temperatures. When tested at a constant temperature of 75° to 80° F, however, they showed moderate or even complete susceptibility. Thatcher, Apex and many of the varieties derived from crosses of *vulgare* varieties with Hope and H44 showed considerable seedling resistance. Hope and H44 derivatives show, however, more mature-plant resistance than seedling resistance. Among the non-*vulgare* varieties, only Iumillo and Iumillo x Mindum were immune and Pentad, Beloturka, Khapli, Black Persian and *T. Timopheevi* were highly resistant. Considerable seedling resistance to leaf rust was shown by the wheat varieties Illinois

No. 1 B.8 and by certain derivatives of the crosses Warden x Hybrid English, Chinese x Progress and Chinese x Emmer. Other varieties showed moderate resistance. The variety McMurachy and the Kenya strains were susceptible to leaf rust. The varieties showing greatest resistance to both stem rust and leaf rust appear to be *T. Timopheevi* and the *T. durum* variety Iumillo.

The oat varieties are divided into six groups on their reactions to the races of stem rust. One group consisting of several strains derived from the cross Hajira x Joannette are resistant or moderately resistant to all 11 races. Another group comprising strains derived from the crosses Hajira x Banner and Victoria x (Hajira x Banner Sel. 524) show resistance to all races except race 6. Another three groups show resistance to some races and susceptibility to others. The sixth and largest group of varieties are susceptible to all races of stem rust.

Resistance to all 9 races of crown rust was shown by the varieties Victoria, Trispermia (a recent introduction from Rumania) and a number of pure lines from the cross Victoria x (Hajira x Banner Sel. 524). The variety Bond (*A. byzantina*) was immune to all races except the rare race 45 to which it proved highly susceptible. Considerable resistance was also shown by the varieties Ruakura and Glabrota (*A. strigosa*). All other varieties proved susceptible to 5 or more races. The only varieties combining a high resistance to stem rust with a high resistance to crown rust were certain of the Victoria x S-524 hybrids.

OATS 633.13

262. CAFFREY, M.

633.13:575(41.5)

Glasnevin Ardri oats.

J. Dep. Agric., Eire 1940 : 37 : 354-61.

A new oat variety, Glasnevin Ardri, has been obtained from a cross between Glasnevin Sonas and Victory II. The breeding method adopted was to make a large number of individual plant selections in the F_2 and to confine reselections to the most promising lines in the third, fourth and fifth generations. All progenies having tall weak straw or coarse, chaffy, thin grains were ruthlessly discarded. Details are given of the small scale tests of the new variety and of its performance in the oat variety quantitative experiments conducted by the Eire Department of Agriculture. Glasnevin Ardri is capable of giving satisfactory yields under a wide range of soil and weather conditions and is outstanding in its ability to resist lodging. Tiller counts show that the new variety compares well with other varieties of spring oats in this respect. Glasnevin Ardri ripens about one day later than Victory II and approximately five days earlier than Glasnevin Sonas.

263.

633.13:575(42)

Picton winter oat.

Nat. Inst. Agric. Bot., Cambridge [1940] : Pp. 4.

The white-grained winter oat, bred by Dr. H. Hunter at the Cambridge Plant Breeding Institute and tested by the National Institute of Agricultural Botany under the number 87/1, has now been released under the name Picton. It is a selection from the cross between Grey Winter and Argentine and is offered as a substitute for Grey Winter, which it excels in yield of grain, resistance to lodging, feeding quality (low husk percentage) and earliness. It is almost as winter-hardy as Grey Winter and shows no signs of susceptibility to eelworm.

MAIZE 633.15

264. POUND, F. J.

633.15:575

A few facts about maize for the Trinidad grower.

Proc. Agric. Soc. Trin. Tob. 1940 : 40 : 241-62.

In the section on selection for planting, directions are given for seed selection and very brief accounts are given of the hybrid maize and ear to row methods of breeding.

265. EDWARDS, E. T.

633.15:575.125:575(73)

The American hybrid maize programme.

J. Aust. Inst. Agric. Sci. 1940 : 6 : 146-53.

It is pointed out that in the U.S.A. attempts to improve maize by variety selection have now been abandoned in the main maize growing states and have been replaced by the synthetic building up of hybrid strains by inbreeding and hybridization. In Iowa (the main maize producing state in America), 75% of the maize area was sown with hybrid seed in 1939 as

compared with 0.4% in 1933. Similar increases have taken place in other maize producing states. The technique of hybrid maize production, the nature of inbred lines, the advantages of hybrid maize and the commercial methods for producing hybrid seed are all discussed in this article.

266. BRYAN, W. W. and
SCHINDLER, A. J. 633.15:575.125:575(94.3)
Hybrid maize for Queensland.
Qd Agric. J. 1940 : 54 : 353-60.

In 1926 a hybrid maize breeding programme was started in Queensland and it has now reached the stage for testing the hybrids in farm trials. The first farm yield trials suggest that by using the better hybrids an increase in yield of about 20% over the yield of the best adapted varieties may be expected in those areas for which the particular hybrid is suited.

267. DARLINGTON, C. D. and
UPCOTT, M. B. 633.15:576.312.34:576.356.4
The activity of inert chromosomes in Zea Mays.
J. Genet. 1941 : 41 : 275-95.

The supernumerary "B" chromosomes of maize are short and heterochromatic. Because they have no evident genetic effect they have been called inert. Their chiasma frequency per unit length is less than that of the normal maize chromosomes and as they are frequently unpaired they tend to get lost at meiosis. At mitosis too they are subject to irregularities. In spite of these mechanical factors tending to cause their disappearance from the population, the B chromosomes survive and appear to have an equilibrium value. They must therefore perform some useful function which gives them a selective advantage. It is suggested that they do the work usually done by the heterochromatic parts of genetically active chromosomes, e.g. the knobs of the normal chromosomes of maize. Thus B chromosomes provide an instance of division of labour in a hitherto disregarded function of the chromosomes: the maintenance of their own mitotic activity.

BARLEY 633.16

268. PERCIVAL, J. 633.16:576.16
The origin of barley.
Suppl. Book of Dunns Farm Seeds 1941 : Pp. 2.

A brief popular account. It is suggested that the two-rowed cultivated barleys have all arisen from Wild Barley (*Hordeum spontaneum*) and that the six-rowed types arose from a wild plant which "sported" to give a six-rowed form.

269. CHIN, T.-C. 633.16:576.312.35
633.16:575"793"
The cytology and genetics of *Hordeum*.
Abstr. Diss. Univ. Camb. (1939-40) 1941 : 13-14.

Meiosis and mitosis were studied in a number of wild *Hordeum* species. *H. pusillum* Nutt. was found to be a diploid ($n = 7$); there were two forms of *H. nodosum* L., one diploid ($n = 7$) and the other allotetraploid ($n = 14$); and the following species were found to be allotetraploids ($n = 14$), *H. gussoneanum* Parl., *H. jubatum* L. and *H. murinum* L. *H. bulbosum* L. ($n = 14$) was found to be an autotetraploid, forming many quadrivalents at meiosis. Cell size and osmotic pressure were not correlated with chromosome number.

In the second part of the thesis the inheritance of earliness in cultivated varieties of barley is discussed. The following crosses were studied, Big Wheat Barley x Goldthorpe, Chevallier x Plumage, Lapin x Goldthorpe, Lapin x Spratt-Archer and Pertun x Goldthorpe. In each case at least two pairs of genes are involved. Earliness was found to be dominant and the varieties Goldthorpe, Plumage and Spratt-Archer, to be homozygous for both recessives. The other four varieties vary in their earliness and, if each of them is assumed to possess two pairs of dominant genes, then the dominant genes in the four early varieties must vary in the degree of earliness which they produce. The results also suggest that the degree of earliness of hybrid plants depends upon the number of dominant genes they possess.

MILLETS AND SORGHUM 633.17

270. KRISHNASWAMY, N. and RANGASWAMI AYYANGAR, G. N. 633.174:575.127.2:633.282:582
633.174:576.312.35
Note on *Sorghum Stapfii* C.E.C. Fischer.
Curr. Sci. 1940 : 9 : 461-62.

Sorghum Stapfii C.E.C. Fischer is a wild grass native to India. Meiotic studies show its chromosome number to be $n = 10$. It hybridizes easily with *S. sudanense* Stapf. and both parental types occur in progenies from the hybrid. It is suggested that *S. Stapfii* should be placed in the series *Spontanea* of the subsection *Arundinacea* in Snowden's classification (cf. "Plant Breeding Abstracts", Vol. VII, p. 122) of the genus *Sorghum*.

271. JANAKI-AMMAL, E. K. 633.174:576.312.34:576.356.4
Chromosome diminution in a plant.
Nature, Lond. 1940 : 146 : 839-40.

Of 100 plants of *Sorghum purpureo-sericeum* (a non-cultivated species of the group *Parasorghum* with $n = 5$ chromosomes) 40 had extra chromosomes in the pollen mother cell divisions. The extra chromosomes behave like the B chromosomes of maize at meiosis, but are not entirely inert as plants with increasing numbers of them have decreasing pollen fertility. When the root tips of 20 plants with extra chromosomes were examined only the normal $2n = 10$ chromosomes were found, although in mitosis in flower tissue the extra chromosomes were present.

Further study of this developmental control of the chromosome complement is expected to yield interesting results.

272. RANGASWAMI AYYANGER, G. N. and VENKATARAMANA REDDY, T. 633.174:581.46:575.11
***Sorghum*, spikelet—awn relationships and inheritance.**
Madras Agric. J. 1940 : 28 : 306-08.

In a range of wild *Sorghum* species awn length is positively correlated with spikelet size. Among the cultivated races the relationship is less straightforward, though it holds in *S. coriaceum* Snowden.

In a selection of *S. caffrorum*, with small, ovate spikelets and short awns, a natural cross with *S. coriaceum* was found. The F_1 had small ovate spikelets and short awns and in the F_2 there was segregation into 81 plants with small ovate spikelets and short awns and 31 with large elliptical spikelets and long awns. Monogenic segregation for the same characters was also obtained in the F_3 .

The larger spikelets had also larger anthers, stigmas and lodicules.

RICE 633.18

273. BERWICK, E. J. H. 633.18:575(91)
Pure strains of padi in Krian.
Malay. Agric. J. 1940 : 28 : 429-35.

Details are given of the selection work which has been going on since 1916. Two pure strains, Seraup Kechil 48 (known as S.K.48) and Siam 29 (known as Sm. 29), were finally chosen as being suitable for Krian North and Krian South respectively. Both yielded well and were fair millers. Sm. 29, however, had to be discarded because of its weak straw. The acreage grown of S.K. 48 has increased steadily and in 1939 about 70% of the rice in Krian was made from this padi. New selections are now being made and several appear to be promising.

274. 633.18:575(94.4)
Rice Research Station.
Hawkesbury Agric. Coll. J. 1940 : 37 : 126-27.

The Rice Research Station, now known as the Leeton Experiment Farm, covers 640 acres in the Murrumbidgee Irrigation Area and one of its activities is the selection of improved strains. No variety has so far proved good enough to replace the station selections Late Caloro and Caloro 2. With the former variety a world record crop of 4 tons (216 bushels) per acre was grown in 1937.

FORAGE GRASSES 633.2

275. ENGELBERT, V. 633.21:581.163:581.162.3

Reproduction in some *Poa* species.

Canad. J. Res. 1940 : 18 : Sect. C : 518-21.

Pollination was found to be necessary for seed production in strains of *P. arctica*, *alpina*, *alpigena* and *pratensis*, but the progeny of crosses all resemble the mother plant. This suggests that fertilization does not take place and that the pollen acts only as a stimulus causing the ovule to develop.

276. WHITE, W. J. 633.289:575.127.5:633.11:575

Intergeneric crosses between *Triticum* and *Agropyron*.

Sci. Agric. 1940 : 21 : 198-232.

This paper presents the results so far obtained in a breeding programme directed towards the development of a large seeded forage crop by crossing *Agropyron* species with various species of wheat. Diploid, tetraploid and hexaploid *Triticum* species were used in the crosses and ten species of *Agropyron* were tried as parents.

No hybrid seeds were obtained from crosses between *Triticum* species and the following species of *Agropyron*: *A. repens*, *subsecundum*, *Smithii*, *cristatum*, *inermis* and *juncum*. In the crosses *Triticum* spp. female x *A. trichophorum*, 2.4% of the florets pollinated set seed. Using *A. elongatum* as male parent, the percentages of florets pollinated which set seed were, 12% with *Haynaldia villosa* as female parent, 0% with *T. monococcum*, an average of 23.5% with tetraploid species of *Triticum* and an average of 13% with hexaploid *Triticum* species. Using *A. glaucum* as male parent, the percentages were 1% with *Haynaldia villosa*, 10% with tetraploid species of *Triticum* and 5% with hexaploid species of *Triticum*. Percentages of seed setting were considerably lower when the grasses were used as female parents.

The F_1 hybrids were found to be highly or completely sterile and resembled the *Agropyron* very closely. They were back-crossed to wheat in order to make the progenies more wheat-like and also to obtain greater fertility. The back-crosses were mostly made with the F_1 hybrids as female parents and the wheats as male parents. A few back-crosses were also made to the grass parents. The hybrids between hexaploid wheats and *A. elongatum* were found to be the most fertile, with an average of 4.6% seed setting.

The characteristics of progenies of *A. elongatum* parentage are then given in detail—vigour, growth habit, winter-hardiness, fertility, seed characters, seedling, stem, leaf and head characters, forage quality and disease resistance being the sub-headings in this section of the paper. The progenies considered are the F_1 , F_2 , F_3 and F_4 and the first, second and third back-cross generations. Assuming that "ripening off" gives an index of the annual habit, all the F_1 are classified as perennials, 2.6% of the F_2 as annuals and 4% of the F_4 as annuals. The average winter survival of F_1 hybrids was about 70% and of F_2 hybrids from hexaploid wheat x *A. elongatum* 35%. From the F_2 to the F_4 the survival of plants of each succeeding generation was at least 50% lower than that of the preceding one. Back-crossing to wheat decreases hardiness while back-crossing to *A. elongatum* increases it. Increases in fertility over those found in the F_1 and F_2 were shown by the F_3 and F_4 generations. The back-cross generations showed much greater increases in fertility. Hybrids which had Hope wheat as a parent had especially high fertilities. The back-cross to wheat material was much more promising than the non-back-cross material for obtaining types with large seeds. The F_1 plants were very similar to *A. elongatum* in forage quality (this parent is rather undesirable as a forage grass) and the F_2 to F_4 were generally similar to the F_1 . Occasional plants in the back-cross generations with wheat were of a more desirable type. The F_1 to F_4 progenies never showed any rust infection but stem rust susceptible plants have occurred in the back-cross to wheat progenies. The characteristics of progenies of *A. glaucum* parentage are considered in the last section of the paper in a similar way to the *A. elongatum* progenies. The results are more or less similar to those given for *elongatum* progenies. The F_1 hybrids of *A. glaucum* parentage are, however, reasonably good from the forage standpoint.

ROOTS AND TUBERS 633.4

277. 633.491:575(42)

633.491-2.412.5-1.521.6

633.491-1.521.5

SALAMAN, R. N.

The Ormskirk Potato Research Station.

Nature, Lond. 1940 : 146 : 634-37.

The work of the Ormskirk station is reviewed on the occasion of the termination of its official

connexion with potato variety work in Great Britain in collaboration with the National Institute of Agricultural Botany and the Ministry of Agriculture. The important lines of work done there have been testing for resistance to wart disease, the elimination of synonyms and the fostering of a more rational attitude to potato breeding and varieties. Through the Lord Derby Snell Memorial Medals and the trials associated with them the breeding of new potato varieties has been encouraged.

The main factor inducing the Ministry to abandon the station has been the development of a reliable laboratory test of wart-resistance.

278. PETTERSSON, M. L. R. 633.491-2.411.4-1.521.6:578.08

Xeromorphy and its bearing on disease resistance in plants.

Abstr. Diss. Univ. Camb. (1939-40) 1941 : 19-20.

The second part of this dissertation gives an account of work done in connexion with breeding blight resistant potatoes. A new "humidity dish" method used in testing the reactions of leaves to blight infection is described and has been found to be very reliable. A series of nine reaction types to the disease under very humid conditions was found.

FIBRES 633.5

279. AHMAD, N. 633.51:581.6:575(54)

Annual Report of the Director, Technological Laboratory for the year ending 31st May, 1940.

Indian Cent. Cott. Comm., Bombay 1940 : Pp. 40.

The spinning performances of a number of cotton samples grown in India and possessing special features are given. Selections of Hyderabad-Gaorani and Bani 306 cottons grown in the khariff season in certain parts of Hyderabad had quite satisfactory spinning performances. Eleven strains of Kharkhedi cotton, which were resistant to root-rot, were very much inferior to Broach 9 in spinning qualities. "Segregate 8-1" (from the cross 1027 A.L.F. x 1A Long Boll), which is resistant to wilt, was found to give a performance equal to 1027 A.L.F. when grown at Shesa but a lower one when grown at Surat. Mill tests on large scale samples placed Segregate 8-1 in an intermediate position between the good performance of 1027 A.L.F. and the poorer one of 1A Long Boll. A new selection M.9-20 was found to give somewhat stronger yarns than M.9 Garo Hill cotton (plants of which may attain 12-15 feet) and would appear to be well suited for mixing with short staple wool or for such non-textile purposes as the manufacture of gun cotton and hospital lint since it has a rough feel and a high fibre weight per inch.

280. KNIGHT, R. L. and CLOUSTON, T. W. 633.51-2.3-1.521.6:575.11

The genetics of blackarm resistance. II. Classification, on their resistance, of cotton types and strains. III. Inheritance in crosses within the *Gossypium hirsutum* group.

J. Genet. 1941 : 41 : 391-409.

In part II of this series (cf. also "Plant Breeding Abstracts", Vol. IX, Abst. 1312) the grade of resistance to *Bacterium malvacearum* of a wide range of material is given. Complete immunity was not found in any New World cottons but exists in some of the Old World species. The Asiatic x New World hybrid R.U.4 (36) 23-1 had a high degree of resistance. The results reported here do not always agree with those obtained on St. Vincent under conditions of natural infection. It is suggested that this is due to much of the infection occurring there being through the seed.

In part III the results of the crosses Uganda B.31 x 514 and B.31 x 513, all Upland types, are analysed, reference being made also to crosses with the *G. barbadense* variety Sakel. Uganda B.31 was already known to carry the major factors for resistance B₁ and B₂. The variety 514 is considered to have only minor factors for resistance. These prevent its being completely susceptible and obscure somewhat the expected segregations due to the major factors. The variety 513 is more resistant than 514 and was shown to carry the major factor B₂ together with several very weak resistance factors. It is not possible therefore to add its resistance to B.31 (cf. also "Plant Breeding Abstracts", Vol. X, Abst. 621).

281. PATEL, J. S. 633.523:575(54)
Annual Report of the Agricultural Research Scheme for the year 1939-40.
 Indian Cent. Jute Comm. Calcutta 1940 : Pp. 50.

This report deals with the first season's work of the agricultural laboratories of the Indian Central Jute Committee.

A collection of varieties and types taken over from the Bengal Department of Agriculture was studied in replicated progeny row tests and varietal trials. To arrive at a useful basis for selection in the field the correlations of a number of characters were worked out. It was found that diameter at the base and height of stem offer a useful basis for selection. About 800 new selections have been made and intervarietal and interspecific crosses have been made. Studies are in progress on inheritance of chlorosis, length of fibre, serrated leaves, colour and pod shape. The effect of variety and other factors on quality has been studied. A histological study of fibre development has been made and varieties and strains have been tested for resistance to stem rot (*Macrophomina*), chlorosis (possibly a virus disease) and *Apion corchori*.

SUGAR PLANTS 633.6

282. Experiment station notes. 633.61:575(68.4)
 S. Afr. Sug. J. 1940 : 24 : 453-55.

The South African Sugar Cane Experiment Station at Mount Edgecombe has had its facilities improved by the addition of a double-story annexe to the botanical building.

The variety trials reported by this station in August 1940 include three trials in which seedlings raised locally from imported hybrid seed were tested.

From several hundred N.M. (Natal Mauritius) seedlings, hybrids of P.O.J.2878 x Uba Marot, five were tested against Co.301, but though they were very good, they did not come up to the standard. N.Co. (Natal Coimbatore) seedlings tested included N.Co.147, 164, 117, 151, 211 and 79; the first five are P.O.J.2725 x Co.301 hybrids and N.Co.79 is a hybrid of P.O.J. 2725 x Co.281. These are all worth further trial and N.Co.147 is considered very good.

283. D, H. H. 633.61:575(68.4)
 633.61.00.14(68.4)

Experiment station notes. Valuable fertilizer trials: seedling successes.

S. Afr. Sug. J. 1940 : 24 : 505-07.

D, H. H.

Experiment station notes. Wide range of activity: gratifying achievements.

Ibid 1940 : 24 : 559-61.

D, H. H.

Experiment station notes. Harvesting of experimental varieties: interesting variety trials.

Ibid 1940 : 24 : 617-21.

In addition to reports on sugar cane variety trials, references are made in these monthly notes to the work on raising new seedlings from fuzzi received from Coimbatore, Mauritius and Hawaii. From the first series obtained from Coimbatore (P.O.J. 2725 x Co. varieties) seedlings for field trials have been selected, the cross P.O.J.2725 x Co.201 having given the best results. Of the Hawaiian seedlings 3,000 have so far been planted out in the fields. A second lot of seed from Mauritius has been obtained and has given better germination than the previous lot, but not as good as most of the crosses from Hawaii.

284. 633.61:575(94.3)
Fortieth Annual Report of the Bureau of Sugar Experiment Stations, Queensland.

Brisbane 1940 : Pp. 22.

This annual report gives an account of the whole of the sugar cane research being carried out in Queensland and contains notes on the value of crosses, on testing of new varieties and on the resistance of many varieties to pests and diseases. At the Mackay station the variety

Q. 28 was found to be a particularly vigorous cane and the variety Comus, a seedling raised by the Colonial Sugar Refining Company, has also shown promise. Comus, however, appears to be decidedly susceptible to mosaic disease. In a trial at the Bundaberg station the varieties E. 12 and E. 14 gave good performances and these two varieties have now been placed in the Q series. Q. 42 (formerly E. 12) is satisfactorily resistant to gumming, Fiji and downy mildew but is probably too susceptible to mosaic to be grown on river flats. Q. 43 (formerly E. 14) is also resistant to the three major diseases. During the 1940 cross-pollination period which was a favourable arrowing season, 151 crosses with different combinations of parents were made. In addition nobilizations of *Saccharum spontaneum* and *Erianthus arundinacearum* were attempted. Of the 96 seedlings selected for further observation at Meringa, more than half were from families of Badila and S.J. 4 crossed with a half nobilized *Saccharum robustum* (28 N.G. 251) seedling. At Mackay the family P.O.J.2725 x Co.290 was prominent and at Bundaberg the outstanding combination was P.O.J.2878 x Co.290. Permanent crossing "lanterns", to which the crosses are brought, have been found very useful for making crosses. It appears probable that arrowing in the early free-flowering varieties P.O.J.2364 and P.O.J.2725 can be delayed considerably by removing the blades of all green leaves a few inches above the growing point on one, two or three occasions during the summer growing period. The varieties P.O.J.2878 and P.O.J.2714 have been found to be grub (*Lepidoderma albohirtum*) resistant in the Mackay district. Damage by the sugar cane scale (*Aulacaspis madiunensis*) has been found in the standover crops; the varieties P.O.J.213 and P.O.J.2878 were worst affected while the varieties P.O.J.2725 and Co.290 appear to be fairly resistant. Susceptibility or resistance to attack seems to follow no distinct breeding lines. Trials for resistance to the following diseases, gumming, Fiji, downy mildew and leaf scald have also been carried out.

285. • STEVENSON, G. C.

633.61:575.127.2(69.82)

An investigation into the origin of the sugarcane variety Uba Marot.

Bull. Dep. Agric. Mauritius 1940 : No. 17 : 3-10.

Uba Marot was discovered by Mr. L. Marot at Gros Cailloux, Mauritius, where it occurred as a rogue in a field of old ratoons of the variety 131.P. Its chromosome number has been shown to be $2n = 112-113$ whereas that of Uba is $2n = 118$. It is therefore unlikely that Uba Marot is a derivative of Uba. The author puts forward the view that Uba Marot is in fact derived from a cross between a noble variety and a form of *Saccharum spontaneum* naturalized in Mauritius. The latter has $2n = 64$ chromosomes and is believed to be identical or closely related to the Coimbatore form of *S. spontaneum*. Crosses between noble cane ($2n = 80$) and the Coimbatore form of *S. spontaneum* give hybrids with $2n = 112$, by the functioning of diploid gametes of *S. officinarum* and these hybrids moreover breed relatively true on selfing; the same is true of Uba Marot. F_1 hybrids of the above cross resemble Uba Marot in many features and the author considered the evidence strong enough to warrant acting on the theory that Uba Marot was in fact derived from such a cross.

It is pointed out that this is very similar to the origin of Kassoer in Java.

Uba Marot is being used in breeding work in Mauritius. P.O.J.2878 x Uba Marot has given some promising seedlings for conditions where *Phytlus smithi* is a limiting factor and seedlings of noble canes crossed with Uba Marot are also being used, especially for poor soil conditions.

286. JANAKI-AMMAL, E. K.

633.61:575.127.5

Intergeneric hybrids of *Saccharum*.

J. Genet. 1941 : 41 : 217-53.

Glagah, the Javanese variety of *S. spontaneum*, with $2n = 112$ chromosomes was crossed with *Erianthus ravennae* ($2n = 20 +$ a fragment) and the F_1 and F_2 generations were studied. The F_1 had more resemblance to *S. spontaneum* and was found to have 66 chromosomes ($56 + 10$) in the root tips. At meiosis it formed univalents, bivalents, trivalents and quadrivalents; it was inferred that autosyndesis occurred among the *S. spontaneum* chromosomes and that some of the *Erianthus* chromosomes were capable of pairing with *S. spontaneum* chromosomes.

As would be expected from the irregularities at meiosis in F_1 , the chromosome numbers in F_2 were variable. The seedlings studied cytologically fell into three groups, the largest group being approximately diploid, with 68 to 76 chromosomes. There were also three hypotriploids with 104, 106 and 108 chromosomes and one hypertetraploid with 136. The diploids showed segregation of the *Erianthus* characters presence of awn and compound inflorescence and a unimodal distribution in respect of the proportion of the length of the callus hairs to the

length of the glumes. The triploid and tetraploid seedlings had thicker stems, wider leaves and a larger inflorescence than the diploids. The sugar content of the diploids was considerably less than that of the *Saccharum* parent, that of the triploids and tetraploids slightly so.

Quadrivalents and many univalents were observed at meiosis in the diploid F_2 hybrids and the division was more irregular than in the tetraploid, where a few quadrivalents and even sexivalents were found.

Among the seedlings obtained by pollinating an arrow of P.O.J.2725 ($2n = 106$) with *Imperata cylindrica* ($2n = 20$), four types occurred. There were two apomictic seedlings with $2n = 106$, resembling P.O.J.2725 closely in habit and having the same pollen fertility (23–35%), six seedlings produced by selfing or diploid parthenogenesis, with 108–112 chromosomes and little or no pollen fertility, a triploid self which had 156 chromosomes and failed to flower and five true hybrids with 120 to 134 chromosomes, representing approximately the diploid complement of the *Saccharum* parent with the haploid complement of *I. cylindrica*.

The true hybrids resembled sugar canes very closely and had a high pollen fertility (50 to 80%). At meiosis bivalents and a variable number of univalents were found. An F_2 was raised from a plant with 80% pollen fertility and segregation of *Imperata* characters was observed. Some F_1 seedlings obtained from this cross had sugar contents nearly as high as P.O.J.2725.

The noble sugar cane Vellai (= Lahaina) with $2n = 80$ chromosomes was crossed with the sweet corn Golden Beauty, $2n = 20 + 2B$ chromosomes. Two seedlings were obtained of which one survived and was found to have 52 chromosomes. It is suggested that the cross is difficult because of the relatively low sugar concentration required for the germination of maize pollen. The hybrid is a dwarf, tillers freely, is perennial and can be propagated vegetatively. It shows no sign of flowering. The upper surface of the leaf bears long silky hairs similar to but larger than those in maize. The only other *Saccharum* with this character is the freak cane Troeboc, of Java and the author suggests that the latter may be derived from a cross of *Saccharum* with a member of the Maydeae.

In view of the crossability of the highly polyploid *Saccharum* species, the fertility of their progeny and the versatility of their reproduction, the author points out that there exists a vast field of hybridization work which has yet to be explored.

287. LADELL, W. R. S. 633.61:582(72.92)
Cane varieties. Part I.

Jamaican Ass. Sug. Tech. Quart. 1940 : 4 : 4–23.

Tabulated descriptions are given of 16 varieties of sugar cane cultivated in Jamaica.

288. 633.61–1.524(69.82)

STEVENSON, G. C. 633.61:575(69.82)

Sugar-cane varieties in Mauritius. An historical review, with particular reference to present breeding problems.

Emp. J. Exp. Agric. 1940 : 8 : 301–10.

After an account of the early history of sugar cane culture in which it is suggested that the cane varieties of the world had two distinct sources of origin (the thick or "noble" canes in southern Asia and the adjacent islands and the thin canes around the head of the Bay of Bengal), the author discusses the history of cane varieties in Mauritius. The first successful introductions were probably Indian noble canes of the Otaheite group. The Otaheite cane was the standard variety until about 1850 when it was abandoned because of its extreme susceptibility to diseases (root disease, gumming and mosaic) when grown under intensive conditions. It is suggested that Otaheite will never again be deliberately introduced into a cross, though varieties remotely descended from it will continue to play a large part in hybridization programmes. The Otaheite canes were replaced by varieties of the Cheribon series, the first known introduction being in 1782. By 1858 the Cheribon canes were widely grown in the island. From 1877 to 1879 there were introduced into Mauritius large collections of canes from several parts of the world. It is pointed out that the Cheribon canes are the most valuable breeding material among the noble canes. Characteristics of their derivatives are good growth habit, comparative hardiness and excellent milling quality. The policy of one line of breeding work in Mauritius is to keep as close to the direct Cheribon line as is possible and consistent with the maintenance of adequate vigour and disease-resistance in the seedling progenies. The Tanna cane, introduced in 1869, was at one time a most popular and valuable cane in Mauritius (in 1925 it occupied 63% of the cane acreage), but it has not

proved successful as a breeding cane. The Penang or Salangore cane, introduced about 1850, was also a popular cane and its derivatives are still being used in breeding work. The author next considers "nobilization" and interspecific hybrid canes. Although nobilization schemes are being carried out at most cane breeding stations and although many new successful varieties do descend from *S. spontaneum*, the author suggests that there are difficulties in such work, e.g. it is doubtful whether the required qualities of the wild ancestor will persist in the progeny beyond the fifth nobilization stage. It is also possible to extend the range of variability (including disease resistance) by crossing different groups of noble canes. The future policy in Mauritius will therefore be to extend the breeding of noble canes, using the progeny test as an indicator of the breeding value of the parent varieties. Finally it is pointed out that, since cane varieties are vegetatively reproduced, cane breeding has always been somewhat empirical, involving the production of large seedling populations which are subjected to rigorous selection.

289. MUNGOMERY, R. W. and BUZACOTT, J. H. 633.61-2.7-1.521.6
Varietal resistance to cane grubs.
 Cane Gr. Quart. Bull. 1940 : 8 : 45-47; also Aust. Sug. J. 1940 : 32 : 325-26.
 McDougall, W. A.
Notes on the use of varieties in lessening grub damage to cane.
 Cane Gr. Quart. Bull. 1940 : 8 : 48-49.

In the first paper it is pointed out that varietal resistance to cane grubs is of several types. Some varieties are able to reproduce roots rapidly after root pruning has taken place (e.g. S.J.4), others have a very extensive root system so that the grubs do not destroy all roots (e.g. P.O.J.2878), while still other varieties do not appear to attract ovipositing beetles (e.g. Q.29). Under conditions of moderate infestation P.O.J.2725 is very resistant to grub attack and P.O.J.2878 also has some resistance. Q.10 is very susceptible and Co.290 also showed a fair amount of damage.

In the second paper a classification of varieties for grub resistance in the Mackay district is given. P.O.J. 2878 and P.O.J.2714 are grub resistant; S.J.2, Orambov, Korpi, H.Q.426, Q.813, Q.20 and N.G.15 are grub susceptible and E.K.28 is classified as intermediate. Co.290 does not appear to have much resistance and P.O.J.2725, a more recent cane than P.O.J.2878 in this district, seems to warrant a trial in grubby areas.

STIMULANTS 633.7

290. 633.72:575(54)
Tocklai Experimental Station Annual Report 1939.
 Indian Tea Ass. Sci. Dep. 1940 : Pp. 33.

A series of forms of the tea plant has been recognized, grading from light-leaved Assam to a China type and certain growth characters and qualities of the manufactured leaf have been correlated with the position the particular plant occupies in the series.

Studies on fertility have shown that it is considerably affected by source of pollen. A collection of 9 clones is considered necessary to ensure a 19:1 chance of an average seed crop. In one case selection of the pollen source resulted in a 36% set as compared with the more average 2% by random pollination.

Progress has been made with methods of vegetative propagation. Bushes have been selected which give easily rooted cuttings. The success obtained in bud grafting has been raised to 79%; it varies with the stock used.

Hair density of the leaf, a character of economic importance, varies with the jat and seems to be a heritable character.

Data from 3,000 manufactures of leaf from individual bushes show that there is a close and significant correlation between "briskness" and quality.

291. 633.72-1.557:575(68.9)
Report of the Agricultural Officer, Mlanje Experimental Station 1939.

Nyasald Tea Ass. Quart. J. 1940 : 5 : No. 2 : 1-5.

In 1938 a study of individual bush yields in tea was started and still continues. It has already shown that replacing the 10% lowest yielders by average yielding bushes would raise the total yield by 5% and replacing them by selected types would raise the total yield 12%.

292.

633.73:581.6:575(67.8)

**Fifth Annual Report of the Coffee Research and Experiment Station,
Lyamungu, Moshi 1938.**

Dep. Agric. Tanganyika 1940 : Pp. 39.

A study has been started on the specific gravity of coffee beans since the trade considers that compactness of bean is connected with quality. The specific gravities of random ungraded samples of 400 beans per tree were determined and were found to range from 1.40 to 1.15. Beans from best trees are all of high specific gravity but it is suggested that high specific gravity is connected with good roasting qualities rather than actual "cup" qualities. Selection work at the station is being continued and the trees are grouped according to definite characteristics such as regularity of bearing and liquorer's report. The characteristics of five trees which meet all criteria of selection are given in a table.

293. LAMBERS, Hille Ris

633.73-1.524(6)

Impressions of the coffee-growing in East and Central Africa. I, II.

E. Afr. Agric. J. 1940 : 6 : 32-33, 74-76.

This is a translation by R. E. Moreau of an article which has already been abstracted, cf. "Plant Breeding Abstracts", Vol. X, Abst. 836. L. R. Doughty has commented on several points in a number of footnotes.

294. VOELCKER, O. J.

633.74:575(66.1)

A review of cacao selection in the Cameroons.

Trop. Agriculture, Trin. 1940 : 17 : 223-25.

A brief account is given of the results of two years' individual tree recording by Herr E. Mylord, of the Westafrikanische Pflanzungs-Gesellschaft "Victoria" on a block of 5,440 trees of the Trinitario complex. Green-podded trees yielded slightly higher than red-podded, but the heaviest yielders were found in the latter class. No difference in the incidence of black pod disease (*Phytophthora*) could be found between green and red-podded trees. Selected trees yielded at the rate of 23 to 33 cwt. per acre, compared with an average of 2 cwt. per acre on estates in the Cameroons.

OIL PLANTS 633.85

295. WEBSTER, C. C.

633.854.56:575

Notes on the cultivation of tung oil trees. Part 3: Possibilities for the production of improved planting material.

Nyasaland Tea Ass. Quart. J. 1940 : 5 : No. 2 : 6-10.

Individual tree records of plots of *Aleurites montana* have shown that about 40% of the trees are very low yielding and may be termed "male" trees since they bear only about 5% of female blossoms. The remaining trees, most of which have mainly female blossoms, yield at least 8 times as much dry seed per tree and the best 8% of the trees yield about 16 times as much. It is evident therefore that there is wide scope for improvement by selection of planting material.

In *Aleurites Fordii* no evidence was obtained of a proportion of unprofitable male trees and the variation in yield was less than in *A. montana*, but there is still ample scope for improvement by selection.

While the use of seed of selected mother trees would be expected to produce some improvement, much stricter control of plant material can be obtained by vegetative propagation. The different methods are reviewed and it is reported that budding presents no difficulties and appears to be the most promising method. The vegetative propagation of rootstocks is also mentioned.

296. PUTT, E. D.

633.854.78:575.11:581.162.32

Observations on morphological characters and flowering processes in the sunflower (*Helianthus annuus* L.).

Sci. Agric. 1940 : 21 : 167-79.

Observations on the morphological characters, stem branching, stem strength and seed coat colour (three different seed coat layers are recognized) and on the flowering processes (both for the whole head and single flowers) are given. The sunflower was found not to be wind pollinated to any large extent, most of the pollination probably being carried out by bees. The amount of natural crossing was found to be about 70%. Segregations in an F_2 between two pure breeding inbred lines showed that branching stem was dominant to single stem, black and

white striped seed to black and grey and autumn frost resistant to autumn susceptible. Each pair of characters was due to a single gene difference and the three genes showed no linkage.

297. BANERJI, I. 633.854.797:576.312.35
A contribution to the morphology and cytology of *Carthamus tinctorius* Linn.

Proc. Nat. Inst. Sci. India 1940 : 6 : 73-86.

An account is given of the development of the flower and pollen grains and the embryology of *C. tinctorius*. The chromosome number was found to be $n = 12$.

RUBBER PLANTS 633.91

298. 633.912:575(91)
Annual Report. Botanical division. III. Selection and breeding.
 Rubb. Res. Inst. Malaya (1939) 1940 : 130-41.

The yields of new rubber clones from estate mother-trees, of trees in the clone collection, of legitimate seedling families obtained by hand pollination, of new clones from legitimate seedlings, of illegitimate seedlings of high-yielding clones and of seedlings from isolated seed gardens are given in a series of tables. All the new clones from estate mother-trees have yielded at least 50% more than Avros 50, the control clone. The legitimate seedling families, A44 x B84, B58 x B84 and B84 x B16 have shown substantial increases in yield. Illegitimate seedling families from clone B.84 continue to be high yielding. Good yields have also been obtained from illegitimate seedlings of the following clones, Prang Besar 49, 86, 24, and 25, Sungei Reko 9 and Sabrang 24.

1939 was a very poor year for obtaining seeds by controlled pollination owing to the exceptionally dry weather between pollination and harvesting. The results do, however, confirm those of previous years suggesting that B.84 gives poor results when used as the female parent.

299. MANN, C. E. T. 633.912:575(91)
Improvement in the quality of rubber planting material.
 J. Rubb. Res. Inst. Malaya 1940 : 10 : 108-25.

This article contains an account of the work of the Rubber Research Institute of Malaya on the breeding and selection of improved planting material during the years 1928-1939. The early work consisted of the selection, growing and testing of the Pilmoor clones—two only of these, B84 and D65, proved to be first class. Further tests showed that the high class Pilmoor clones compared well with selected clones from Java and Sumatra. The Javan clone, Tjir I is, however, outstanding and has surpassed all others in yield records. The next step was the breeding of new seedling families (both legitimate and illegitimate) from proved clones. The legitimate families, B.84.A44 and B.58.B.84, were outstanding in their yields. Illegitimate seedlings of the clone B.84 were also very high yielders. Finally new clones have been established from the legitimate seedlings—these clones form the R.R.I. "500-Series". It is also pointed out that budded trees of a single clone show a much higher degree of uniformity in habit, growth and yield than the most uniform legitimate seedling progenies and that this uniformity makes it possible to work out the best methods of treatment for each clone.

300. 633.912-1.524(42)
Hevea seeds from Brazil.

Rubb. Res. Inst. Plant. Bull. 1940 : No. 13 : 8-9.

Continuing the discussion as to whether Sir Henry Wickham did smuggle *Hevea* seeds out of Brazil (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 64), Mr. W. A. Wilken writes of a talk which he had with Sir Henry. In answer to a question, Wickham said that he had permission from the Brazil Government to collect seeds and it was only at the last moment when he had his collection ready for shipment and even had the consignment papers completed that he was informed that he would not be allowed to remove the collection. Wickham then went down to a port, managed to get hold of a British tramp steamer that was ready to sail for England, put his collection on board and handed to the captain his completed papers permitting the export of the seeds. The seeds thus duly arrived at Kew.

PALMACEOUS AND OTHER TREE FRUITS 634.6

301. HOFMEYR, J. D. J. 634.651:575.116.7
Sex-linked inheritance in *Carica papaya* L.
 S. Afr. J. Sci. 1939 : 36 : 283-85.

The results of a three-point test involving the sex, flower and stem colour genes showed that

the genes *Pp* for purple versus non-purple stem colour are fairly closely linked with the *Yy* genes for yellow versus white flower colour and comparatively loosely so with the sex factors *M*₁, *M*₂, *m*.

The order of the genes was found to be M23.7Y17.3P.

Some aspects of the results obtained are discussed in the light of the author's previous findings (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 85 and Vol. X, Absts 309 and 654).

302. HOFMEYR, J. D. J. 634.651:577.8:575.1:581.02

Sex reversal in *Carica papaya* L.

S. Afr. J. Sci. 1939 : 36 : 286-87.

The term sex reversal in this paper is limited to change of sex in the individual flowers on pistillate, staminate and hermaphrodite trees.

What is probably the first case of sex reversal in the flowers of pistillate plants of *Carica papaya* L. is reported.

From his observations, the author concludes that change of sex and the type of such change are apparently affected by both genetic and environmental factors. Good growing conditions favour a change towards femaleness in both staminate and hermaphrodite plants, while poor conditions tend to promote maleness.

The pistillate plant is the most stable, the hermaphrodite very unstable, and the staminate plant intermediate in this respect.

303. POPENOE, W. 634.653:582

The avocado—a horticultural problem.

Trop. Agriculture, Trin. 1941 : 18 : 3-7.

An account is given of the history of avocado varieties. Three groups of varieties are recognized, the West Indian, Guatemalan and Mexican races. The probable native homes of these three races are discussed. It is suggested that West Indian-Guatemalan crosses will produce the best varieties for avocado culture in the West Indies.

SMALL BUSH FRUITS 634.7

304. BEAKBANE, A. B. 634.71:576.16

Studies of cultivated varieties of *Rubus* and their hybrids. II.

Description and selection of clonal races of some cultivated blackberries and hybrid berries, including loganberries.

J. Pomol. 1941 : 18 : 368-78.

The origin, history and botanical characters of the Himalaya berry, Black Diamond, Parsley Leaved Berry, Loganberry, Phenomenal Berry and the Laxtonberry are described. A number of Loganberry variants were found and it seems probable that they arose as seedlings of the Loganberry or some related form. Although no differences in botanical characters have been observed between the two varieties Himalaya Berry and Black Diamond, they appear to differ in vigour and amount of crop, Black Diamond being the heavier yielder. Two forms of Parsley Leaved Berry were also observed, one being a heavier yielder than the other.

305. LEDEBOER, M. and RIETSEMA, I. 634.723:581.162.5

Unfruitfulness in black currants.

J. Pomol. 1940 : 18 : 177-81.

Sterility of the variety "Lee's" when selfed was found to be due to failure of the male and female nuclei to fuse and not to poor pollen tube growth. If an ovary contains less than four embryos the fruit does not develop.

OTHER FRUITS 634.77

306. 634.771:575.247.061.6

Banana mutation.—A sectorial chimera caused by mutation (in this case loss) in a colour factor.

New Guinea Agric. Gaz. 1940 : 6 : 50-52.

The specimen described was partly red and partly green, red being the original colour and green being considered a somatic mutation or loss. The banana was believed to be a Cavendish type.

Report on the marketing of grapes in India and Burma.

Agric. Marketing India 1940 : No. 20 : Pp. 263.

Pages 15-21 of this report give an illustrated account of the chief varieties of grapes grown in India and on pages 200-02 brief mention is made of the introduction of new varieties and of breeding and selection. A number of new types of Pandhari Sahibi grapes which are definitely superior to Pandhari Sahibi have been obtained by breeding and selection.

VEGETABLES 635**Breeding for resistance to downy mildew of onions.**

Agric. Gaz. N.S.W. 1940 : 51 : p. 562.

It is mentioned that Californian breeders are using selections of the Italian Red variety as parents in crosses for developing varieties resistant to *Peronospora destructor* and that such work is also being carried out by the Plant Breeding Branch of the New South Wales Department of Agriculture.

HATCHER, E. S. J.

Studies in the inheritance of physiological characters. V. Hybrid vigour in the tomato. Part III. A critical examination of the relation of embryo development to the manifestation of hybrid vigour.

Ann. Bot., Lond. 1940 : 4 : 735-64.

Embryo and seed sizes and manifestations of hybrid vigour were investigated in two varieties of tomato, line 107 (a tall commercial variety called "Blaby") and line 105 (a dwarf strain), and in the reciprocal hybrids obtained by crossing the parental strains in both directions. Mean seed weight varies with the number of seeds per fruit, the more seeds per fruit the smaller is the mean seed weight. Fruits obtained by artificial crossing contain a smaller number of seeds than those allowed to self naturally and the smaller number of seeds per fruit will account for hybrid seeds being heavier than selfs. Position of the fruit on the plant also has a small effect on seed weight. The size of seed also depended upon the maternal parent, both self and hybrid seeds from line 105 being very much smaller than the two types of seed from line 107. Studies were made of embryo development from 3 days after pollination to 60 days after. Size heterosis of hybrid embryos, both crosses being larger than their maternal parents, was found in the first and second phases of growth but in the final growth phase (after 50 days) the size of the embryo, whether selfed or hybrid, depended upon the maternal parent only, no heterosis being evident. In these experiments both selfed and crossed seeds were obtained by artificial pollinations and no differences in seed size between selfed and hybrid seed from the same female parent were found.

In the studies of growth from seed germination to mature plants, the two reciprocal hybrids were found to attain the same height and to do so at the same rate, thus manifesting equal degrees of height heterosis (although they have very different seed and embryo sizes). This height heterosis was initiated by a greater development rate between the fifth and tenth leaf stages (i.e. after the onset of flowering). The hybrids also showed heterosis in that the weight of fruit per plant was about twice that of line 107 and about four times that of line 105. This high fruit yield could be explained as due to the combination in the hybrid of favourable factors inherited from the parents. Plants in the parent lines were grown from small and large seeds but seed size was found to have no effect on the size of plants produced.

In the discussion it is pointed out that the results of these experiments do not support Ashby's ideas on heterosis but do give some support to Jones' theory of the complementary action of dominant factors producing hybrid vigour.

ARNOLD, H. C.

Soya beans. Notes on cultivation.

Rhod. Agric. J. 1940 : 37 : 588-606.

Inter alia some non-shattering strains suitable for Southern Rhodesia are mentioned. Potchefstroom No. 184 is the best yellow-seeded variety suitable for milling for human consumption. The other strains, Jubiltan No. 65, No. 67, No. 77 and No. 169 are fodder varieties. They have been bred at Salisbury Experiment Station by crossing Otxi and Biltan, two earlier productions of this station, with a non-shattering strain which suffered from a long growing season and a semi-procumbent habit.

Some new yellow-seeded strains which are under trial have yielded 20% more than Potchefstroom No. 184.

Part II. Foreign.

STATISTICS 519

311. LECLERG, E. L. and
HENDERSON, M. T. 519.24:631.421:633.491
Relative efficiency of the two-dimensional quasi-factorial design as compared with a randomized-block arrangement when concerned with yields of Irish potatoes.
Amer. Potato J. 1940 : 17 : 279-82.

Three sets of uniformity yield data with potatoes were used to determine the relative efficiency of the two-dimensional quasifactorial as compared with the randomized block arrangement when concerned with the yield of different numbers of hypothetical varieties. It was found that the quasi-factorial design was generally more efficient when the tests contained 36 or more hypothetical varieties. The gains in efficiency would appear to be much greater where there are heterogeneous soil conditions.

BREEDING 575

312. 575:633(67.5)
633.855.34:575
Publications de l'Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.). Rapport Annuel pour l'exercice 1937. [**Publications of the National Institute for the study of the agriculture of the Belgian Congo (I.N.E.A.C.). Annual report for the year 1937**].
Congo Belge 1938 : Hors Sér. : Pp. 181.

The report for the year 1937 is the 4th Annual Report issued by I.N.É.A.C. With the exception of the work with oil palms described below, there is very little mention of plant breeding apart from selection work and variety trials. Selection of mother trees and measurements of yield and growth are made at several stations in the colony with rubber (*Hevea*), coffee, cacao, tea and cinchona. Mass and pedigree selections of beans, peas, *Eleusine*, soya beans, groundnuts, maize, sorghum, wheat and cotton are carried out at various stations. Selection work is also in progress with rice; three lines yielding about 2,500 kg. of paddy per hectare have been obtained from selections started in 1933.

Oil Palm.

A considerable amount of work is being done with oil palms (pages 35-50 of the report). Artificial pollinations are made on high-producing, vigorous (mother) trees which have fruits rich in oil. The yields and other properties of these mother trees are given in a table. These mother trees are pollinated with pollen from elite trees which produce at least 120 kg. per year. Results are given of the selection work. In the line G1 there are individual trees which possess a larger number of desirable characters than were found in any single mother tree. It is pointed out that high yields from young trees in the first three years may not mean that these trees will be high yielders but perhaps only that they are precocious. Later such trees may be outyielded by slower growers. In choosing new mother trees from the lines, vigorous growth is considered to be as important as high yield. Some families show a high degree of resistance to leaf mildew and others are highly susceptible. It is suggested that thin shell is a heterozygous condition since from thin-shelled plants there are obtained thick-shelled plants, thin-shelled plants and shellless plants which have aborted fruits. The most noticeable feature of the improved lines is their great heterogeneity. Selection is continued after the plants have been put into the plantations and such selection has increased yields from 20-25%. It is also pointed out that it is useless to increase the potential productivity of the plantations by breeding the high yielding palms unless at the same time the cultural conditions in the plantations are also improved.

313. 575:633(67.5)
633.855.34:575:631.557
Publications de l'Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.). Rapport Annuel pour l'exercice 1938 (1re Partie). [**Publications of the National Institute for the study of the agriculture of the Belgian Congo (I.N.E.A.C.). Annual report for the year 1938 (1st Part)**].
Congo Belge 1939 : Hors Sér. : Pp. 269.

The 5th Annual Report of I.N.É.A.C. is presented in a new form, in 3 parts. The first part

contains accounts of the work which has been done during the last year (1938). A second part, consisting of a collection of memoirs and technical notes is issued for the first time this year (cf. "Plant Breeding Abstracts", Vol. X, Absts 791 and 847). Finally, in a third part it is proposed to give accounts of the work and programmes of certain services in the first five years of their activity.

In this first part of the report, work with many tropical crops is reported but for only a few crops is there an account of breeding work. In addition to the breeding work summarized below, yield trials and the introduction of new varieties are mentioned. A Genetics Department has been formed in 1938 and is chiefly concerned with a morphological and physiological study of the yield of oil palms, *Elaeis* (pages 66-76 of the report, see below).

Observations are being made on mother trees of *Hevea*, *Coffea* and cacao and on tea bushes. Criollo-Forastero cacao hybrids are being studied and the best hybrid trees will be pollinated with the best Forastero trees to obtain plants combining the yield and vigour of Forastero with the quality of Criollo.

Rice.

Two mass selections of rice, Y.3 and Y.6a have been multiplied and will be distributed to growers. Selection work with rice is being continued but lines superior to the standard variety "Manzano" have not yet been obtained. Mass selections of peanuts have also been multiplied.

Cotton.

Selection work with cotton is also carried out (pages 210-12) and high yielding lines with fibre lengths of 31/32 ins. have been obtained. Such lines, however, have shown abnormal capsule dehiscence. Studies have been made of the resistance of cotton strains to stigmatomyces (the disease being chiefly caused by the fungus *Nematospora*). Pedigree and mass selection of cotton, maize and peanuts is practised at the Gandajika station (pages 229-30).

Oil Palm.

The component characters of yield studied are number and weight of clusters, number and weight of fruits and number of spikes. A high positive correlation was found between area of leaf surface and weight of cluster and between leaf surface and number of clusters. The correlation coefficient was particularly high when a population containing both high and low yielders was studied. The coefficient, though still significant, had a much lower value when high yielders only were studied. This suggests that other factors than leaf area must be important in producing high yield. Attempts were also made to compare the photosynthetic activity of different palms. As data for only seven palms were available, the correlation between photosynthetic activity and yield was not significant. Number of stomata per unit area was also investigated but no correlation was found between this quantity and yield. It was proposed to study root development but this had to be abandoned because of the difficulty of making observations and because it would mean mutilating mother trees.

Suction pressure, which gives a measure of the force with which the roots absorb water and solutes from the soil, has been studied. The plasmolysis method of Hunger-Ursprung was not used as this method gives aberrant results. The method of germinating seeds in sugar solutions of different concentrations was found to be satisfactory for maize, rice and cacao but is unsatisfactory for plants such as palms, *Hevea* and coffee whose seeds germinate slowly. In these latter cases a method using germinated seeds and measuring osmotic pressure by the viscosity or the wilting of their tissues has been worked out. This method can also be used for the roots of mother trees. Pollen grain germination on gelatin containing different concentrations of sugar is another method being studied. The standard used is that concentration on which a pollen tube reaches a length of ten times the diameter of a grain.

A considerable amount of breeding work has also been carried out with the oil palm (pages 77-95 of this report and see also annual report for 1937). The improved lines obtained by artificial pollinations continue to yield highly and this high yield is now almost certainly not due to the trees being precocious. The yields of improved lines and families and of out-standing trees are given in a series of tables.

Cinchona.

A certain amount of work is being carried out with *Cinchona* (pages 186-88). Measurements and bark analyses of the seed-producing trees have been continued. Macrostyle plants hybridize readily when left to be open-pollinated but self-pollination appears to be the rule

in microstyle flowers. The F_1 of the cross *C. Ledgeriana* x *C. succirubra* has the morphological characters of *succirubra*.

314. CROSS, W. E. 575:633(82)
 Memoria anual del año 1939. (Annual report for 1939).
 Rev. Industr. Agric. Tucumán 1940 : 30 : Pp. 107.
 Cotton.

Observations are being made on the effect of colchicine treatment on cotton seeds.

The progeny of a chlorophyll deficient plant of Acala Rogers Improved gave two chlorotic plants and 10 normal.

The cross Tucumán C.1 x Acala Rogers Improved and its reciprocal are being studied in duplicate to find whether there is any difference in the progenies of different plants. The cross shows prospects of yielding some promising hybrids.

The cross Acala hoja digitada (Acala digitate leaf) is less promising.

Sugar cane.

Various mutants of the variety P.O.J.36 are under cultivation. The mutant P.O.J.36M is richer in sugar than the original cane and not materially lower in yield. The Paz Posse mutant yields more than the original cane, though it is somewhat lower in sugar content. None of the other mutants of this and other canes studied has proved superior to the original variety.

Of the early hybrids produced by the Tucumán Station Tuc.472 has been the most successful. It has given high yields in the field and in the factory, is mosaic resistant and not damaged by drought and frost. Tuc.407 gives high yields, is very sweet and low in fibre; it is immune to mosaic and highly successful in cultivation. It is also popular for chewing. Tuc.379 is extremely resistant to drought and having surpassed P.O.J.36 in yield and equalled it in sugar content it is regarded as very promising.

Tuc.630 (H.109 x Yellow Tip) has given yields of cane slightly higher than P.O.J.36, with an equal sugar content and is resistant to drought.

Tuc.1376 (Co.243 x Co.244) has considerably exceeded P.O.J.36 in yield of both cane and sugar per hectare and its cultivation is rapidly extending. Other promising canes of the same parentage are Tuc.1406, Tuc.1111 and Tuc.1316, this latter being very early in ripening.

Some of the seedlings of Co.205 (Vellai x *Saccharum spontaneum*) were equal to P.O.J.36 in sugar content and superior in yield; Tuc.2039 was one of the best, though all are too thin to be popular.

Seedlings of H.109 x P.O.J.2878 have been disappointing.

Some of the seedlings of P.O.J.2878 are very promising and Tuc.2611, 2613 and 2622 are especially high in sugar.

Hybrids of P.O.J.2725 x Manoa 315 have mostly proved disappointing; so have seedlings of D.145, hybrids of Striped Mexican x P.O.J.2878 and H.28.4898 x H.26.C.270(1), and seedlings of S.C.12/4, D.625 and Co.223.

Seedlings of Co.213 have been low in sugar, with the exception of Tuc.3140 and 3142, which have exceeded P.O.J.36 in both yield and sugar content.

Seedlings of B.147 have this year been disappointing.

Hybrids of P.O.J.2878 x H.29.1813 are good but not outstanding, with the possible exception of Tuc.2920, which has surpassed P.O.J.36 in yield and is equal in sugar content.

Seedlings of Co.210 (P.O.J.213 x Madras 2) include Tuc.3085 and 3086, both of which have exceeded P.O.J.36 in yield of cane and sugar.

Seedlings of Co.281 have produced only three canes, Tuc.6004, 6050 and 6101, superior to P.O.J.36.

Many of the hybrids Co.290 x H.31.1236 have exceeded P.O.J.36 in both yield and sugar content; these are Tuc.3174, 3233, 4724, 4732, 4750, 4762 and 4764.

The cross H.31.626 x Co.205 (containing therefore *S. sinense*, *S. spontaneum* and *S. officinarum*) has produced a number of varieties of great vigour and at the same time richer in sugar than P.O.J.36, all of which are being studied with great interest.

A number of canes better than P.O.J.36 both in yield and sugar have been produced also from the cross of P.O.J.2878 x a seedling of P.O.J.234.

The cross H.31.626 x H.32.8535, involving the four species *S. officinarum*, *S. Barberi*, *S. sinense* and *S. spontaneum*, has given rise to over 1,000 seedlings, of which 70 appear at present to be superior to P.O.J.36 in yield of cane and sugar per hectare.

In the cross H.33.6446 x H.31.2538 three species are concerned, *S. officinarum*, *S. spontaneum* and *S. Barberi*; most of the seedlings have been a failure but Tuc.3771, 3777, 4805 and 5056 are definitely promising.

No promising canes have been found among the seedlings of D.66/70 or P.O.J.213 or the crosses P.O.J.2878 x H.32.6499 and P.O.J.213 x D.66/30.

At least one vigorous cane, rich in sugar, has been produced from the cross P.O.J.213 x Diamond 10, namely Tuc.6202.

Tuc.6161, from Co.281 x D.66/30 is especially rich in sugar.

Data are given on the flowering of the different groups of seedlings, some of which have not flowered at all.

One of the factors to which great importance is attached in selection is the ability of the cane to stand some days after cutting without risk of inversion. The varieties P.O.J.2725 and Tuc.1423 and 2692 have shown themselves most free from inversion, and Tuc.1111, 1163 and 1316 are less prone than the average.

315.

575:033(92)

Verslag over het jaar 1938 van Het Algemeen Landbouw Syndicaat—Het Zuid- en West-Sumatra Syndicaat—De Centrale Vereeniging tot beheer van Proefstations voor de Overjarige Cultures in Nederlandsch-Indië en van de onder deze Organisaties ressorteerende Vereenigingen en Instellingen. (Report for the year 1938 of The General Agriculture Syndicate—The South and West Sumatra Syndicate—The Central Association for the Management of Experiment Stations for Perennial Crops in the Netherlands Indies and of the Associations and Institutes under the jurisdiction of these Organizations).

Batavia 1939 : Pp. 248.

A committee for the co-ordination of scientific research was set up in January 1938 to promote co-operation between investigators in practical and theoretical fields.

Derris.

In connexion with the improvement of derris, it is requested that samples of wild derris may be collected and forwarded to Dr. Toxopeus of the Plant Laboratory of the General Experiment Station for Agriculture (Plantkundig Laboratorium van het Algemeen Proefstation voor den Landbouw).

Besoeki Experiment Station.

Rotenone determinations were made with special reference to effects of cultural measures on the rotenone content of *Derris*.

Kapok.

Central and East Java Experiment Station.

Work on kapok cultivation was stopped since those interested in this crop decided not to join the C.P.V.

Tea.

West Java Experiment Station.

Buitenzorg and South and West Sumatra Division.

Following Dr. Wellensiek's resignation, van Emden continued the current work on tea selection and began preparations for a series of local clone test plantations as well as starting cytological research.

Anatomical and physiological studies of the tea leaf (including chemical analyses) as well as investigations of growth period are in progress.

Advances have been made in cytological technique as applied to tea. The chromosome number 30 has been confirmed.

Methods of grafting and different types of buddings were investigated.

In an artificial cross-pollination experiment a percentage set of 12% (as determined by the germination of the seed) was obtained.

Pollination of emasculated flowers from which the corolla had been removed apparently scarcely ever occurs.

An experiment comparing artificial selfing with artificial crossing showed that selfing resulted in 19% of the set obtainable by crossing.

In the Pondok Gedeh and Tjiomas experiments on the value of nursery selection in the laying down of selected plucking gardens the excess production at first exhibited by the nursery selected plots is no longer evident; and a similar trend is apparent in the Lodaja and Perbawatie experiments.

Nine new seed gardens (comprising clones from estates or Tjinjiroean clones) have been started, and at Pasir Saronggé three new tests of seedling material.

New mother trees to the number of 154 were selected, making the total of such trees now 3034 of which about 1800 are already undergoing trials.

The progeny from selected seed gardens appears to afford a better basis for mother tree selection than the ordinary plucking gardens.

There are at present 184 trials in progress comprising a total of 1760 clones.

In 1938, 42 new trials were laid down; and in the same year 27 clones were provisionally selected in trials.

A series of plot test plantations is being established at the most important tea centres in Java and Sumatra and will be used for testing a number of promising clones under different types of local conditions.

The quality of the leaf of several clones is being studied by the micro-preparation method.

The nature of resistance to branch canker has been studied.

There is some evidence that the type of *Helopeltis* in West Sumatra may be a local race or sub-variety of *H. antonii* Sign. var. Bradyi and may therefore differ in its attack upon tea from the tea *Helopeltis* of Java.

The optimum depth for sowing tea seed was found by experiment under conditions at Buitenzorg to be between 3 and 6 cm.

Rapid germination of tea seed was successfully induced by exposing seed, previously well damped by being kept between wet gunny sacks, to hot sunshine, which causes the seed coats to split. Within three weeks practically 100% of an experimental lot of seed had burst after this treatment, whereas of untreated seed only 40% had burst after 45 days. The treated seed gave ultimately 85% success in the nursery. (Cf. also "Plant Breeding Abstracts", Vol. XI, Abst. 183).

Silo storage of seed proved successful on one high lying estate.

Observations on optimum density of planting have been summarized.

The chemistry and processing of tea was actively studied and the preparation of small samples from various clones was undertaken in collaboration with the plant breeder.

Central and East Java Experiment Station.

Experimental plantations of tea clones are being laid down in Malang.

Coffee.

Central and East Java Experiment Station.

In tests of the self-fertility of some clones no higher set than 10% was obtained.

With cross-pollination it appears that the percentage set often depends on the mother clone which under certain conditions may let the young fruit drop off.

In order to obtain standards for estimating the productivity of estates an attempt was made to determine the norms for extent of flowering and the number of flowers set. Data for 1936-38 showed that the number of flowers per tree might be 20,000 to 25,000 and the percentage of effective flowers 20 to 25. Production in such a case would range from 14 to 22 q.¹ per ha.

An examination of the further problem of how far the low production on higher-lying damp land is due to the small extent of flowering or too small a set showed that for 1938 (1937 flowering) the extent of flowering on the higher damp lands was mostly below the 20 25,000 standard, while on the drier lands it was frequently above these figures.

Comparison of the curves for flowering and for yield indicated that the preliminary flowering on the high-lying damp lands—thanks to a pretty good ultimate set—seems to contribute relatively more to the output than do the more extensive flowerings that come at the end of the period with little rain.

The study of fruit development in the Robusta clones has led to the conclusion that the actual bean is derived from endosperm-tissue and not from the surrounding ovular tissue.

Research on the causes of round beans and spongy beans is being conducted. Round beans

¹ 1 quintal = 100 kg.

in most cases are due to (1) degeneration of ovule or embryo sac as a consequence of failure of the reduction division—hybridity may be the primary cause; (2) unfavourable conditions at pollination. Spongy beans too may be attributed to hybridity and though here it is not a question of the reduction division, the chromosome number in defective endosperms may in many cases be aberrant. In Kawisari (which is regarded as particularly good experimental material for this problem) the chromosome number is always too low: pollination with high chromosome types is suggested as a remedy.

Cuttings from some types of roots were obtained, from which chromosome measurements could be made, though owing to the too slight difference in their lengths the individual chromosomes could not be identified.

The collection of data for a report on the cytology of some Robusta forms has been completed. The Arabica forms have the number 22 and all the other types examined of Robusta and the Liberica-Excelsa group as well as the species such as *Eugenoides* Kapakata and the doubtful "coffee" form, Schumanniana (of which roots were collected from Djember), have 11 haploid chromosomes, *Coffea Horsfieldiana* alone appears to have $n = 22$. In one type—a chimaera form of SA.109 and the "djamboue" type which arose from the cross SA.109 x BP.42—one or two extra chromosome fragments were found.

Among the Arabica-Laurentii crosses the Arla forms and the most promising forms at Djember (comprising some Arabica-Conuga crosses too) had 44 chromosomes instead of the expected 33. In addition to the productive types from the Arabica-Laurentii cross numerous vigorous but non-productive forms were obtained. Examination of root material from Arabica-Robusta and Arabica-Conuga crosses from Soember Asin and Djember showed that the fertile forms had 44 chromosomes and the sterile or almost sterile ones fewer chromosomes—a finding with practical applications in facilitating the selection of 44-chromosome progeny from crosses between Arabica and 22-chromosome forms.

The possibilities of obtaining polyploid coffee plants by colchicine treatment are under consideration.

A method of obtaining successful root cuttings of coffee has been worked out and much useful information is given on the importance of factors such as age, site from which the cutting is taken and treatment with growth substance in promoting or hindering root formation. Incidentally it was found that the use of "growth substance" paste in grafting coffee has undesirable inhibitory effects.

The Kapakata bushes gave a good yield (mother plant about 12 kg. berries).

The BP.42 x Kapakata cross resulted in 5 vigorous and uniform plants with clear Kapakata characteristics.

From the pollination of *Eugenoides* (Nandi-coffee) with Robusta pollen, hybrids were obtained. A study tour to Central Africa resulted in the importation of seed of many varieties of coffee (cf. "Plant Breeding Abstracts", Vol. X, Abst. 836).

A number of new mother trees, mainly legitimate seedlings, were chosen at Soember Asin. The crosses with SA.34 produced numerous fine-looking trees.

Material for new crosses was selected with due regard to the requirements for grafting material. Many crosses were made with the "lateral scion" clone TP.21. Some forms from the crosses Kapakata 1 x Uganda 1a and Kapakata x Canephora Mad.3 were crossed with BP.42.

In the course of studies of Robusta clones and other varieties and types preliminary trial plantations of many new clones and families have been laid down at Soember Asin.

In four large scale tests of clones the percentage of round beans was determined; SA.13 had a relatively low percentage and PB.25 and Bgn.83-03 high percentages.

Determinations of the average volumetric weight per bean for the various clones showed that BP.42 was in a class by itself as regards bean size, then came SA.158; and bean size in SA.109 and Bgn.83-03—generally regarded as small—is greater than expected and differs little from the remaining clones including SA.13.

The determination of the vegetative characteristics of all known clones is proceeding by the methods that have been evolved.

Plans for new seed gardens, two of which are to be laid down in Central Java, were drawn up. Clone SA 56 appears more susceptible to top die-back but the ill effects in older trees are limited by the vigour of this clone.

In the seedling tests for resistance to eel-worm SA.24, Bgn.124-01 and Quill.121 showed least susceptibility to *Tylenchus similis*. In two similar experiments with grafts, those on

Excelsa were less resistant than those on Bgn 124-01. In general the results differed little from those of the previous year. Apparently grafts of vigorous scions do better in infested soil than "illegitimate" seedlings.

A technique requiring only three young coffee plants for the raising of 4,500 eel-worms in a funnel appears worthy of further examination; and now that it is possible to raise cuttings of coffee on a large scale, selection for eel-worm resistance can be begun.

Four trials have shown SA.158 to be relatively susceptible to the berry borer, while SA.13 and SA.34 showed the lowest percentage of infection.

Yield data from test plantations in Malang and Semarang include a first crop amounting to 2.97 kg. of berries per tree from the cross SA.74 x SA.34.

Considerable research was carried out on the preparation processes and the influence of the various stages of preparation on the quality of coffee was found to be apparently less than in the case of cacao and the investigation of the problem could be regarded as closed in the main. The colour of coffee depends upon the variety and the temperature used in drying the bean. Various clones were tested for differences in flavour and some were found inferior in this respect to mixtures.

Much attention was devoted to extension of test plantations with adequate repetitions for obtaining reliable data on merits of the various clones and families in different centres.

Besoeki Experiment Station.

Stock tests at Kaliwining suggest that only vigorous Robusta forms should be used as stocks for Robusta grafts; Excelsa should not be used with Robusta.

The choice of the proper clones and methods is of great importance in the increasing use of lateral scions.

Work on coffee cuttings in the Congo and Kenya was studied.

Seed of varieties from Kenya has been sown.

Some new crosses between Robusta mother trees have been made.

Examination and selection of the artificial Arabica x Robusta crosses is being continued and buddings and seedlings of the most promising forms are being grown at Kaliwining.

In planting out, clones with the highest compatibility were planted side by side, but to make quite certain of effective pollination *C. arabica* is interplanted, since for years it has constantly given the highest set in back-crossing artificial hybrids.

The study of the characteristics of the Robusta and other clones was continued in the specimen collection in which ten specimens of each newly chosen mother plant are grown. The collection has been greatly added to. Further observations on this material are obtained in the test plantations.

Selection of Excelsa, Liberia and Liberia type varieties was continued in the F_2 and F_3 .

Three very promising clones were obtained from F_3 generation mother trees from Conuga seedlings and seed from them is being re-tested to obtain a constant Conuga type.

Many Robusta hybrid families have also been planted and a couple of test plantations, in one of which some new Robusta clones are being compared with BP.39 and 42, while in the other hybrid families are being tested.

Extensive areas have been laid down in the test plantations with clones and clonal seedlings of BP.42.

Earlier experiments have indicated that BP.42 as a clone has been one of the best producers. For damp, high ground the Conuga and Uganda forms are preferable.

Cacao.

Central and East Java Experiment Station.

Among the features of value for the identification and description of clones, the shape of the corolla has been specially useful.

An improved technique for increasing the number of successful cuttings has been devised.

Genetical research on cotyledon colour has been resumed on the lines described by Ostendorf (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 396). It appears that the good DR clones, DR 2, 18, 34 and 38, and probably also DR 41, lack the basis for (dark) purple and can therefore only give white or light purple seeds on selfing or inter-crossing. The basis of the difference between white and very light purple is still unexplained. It was also found that the percentage of hybrid pods may be pretty high even though the particular tree or clone may be quite capable of self-fertilization.

Pods from different trees were found to vary in attractiveness to *Helopeltis*, probably owing to local factors and to some extent the inherent characteristics of the tree.

Accumulated data from the M.J.305 (Assinan-angoleta) test plantation suggest that clones As 3 and As 8 are the most promising as regards yield and quality though further trials are necessary to compare their performance with that of the good DR clones.

Observations in the M.J.331 plantation of Assinan seedlings and buddings have shown that there is no difference in vigour between trees from white and from purple seeds (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 396). Work on petal shape inspection is completed.

A new plantation has been laid down with Forastero.

The research concluded on the preparation of cacao has given valuable practical results.

The usual yield determination was carried out at Kaliwining.

Aleurites montana.

Some test plantations of *Aleurites montana* have been laid down in localities differing in climate and soil in addition to the central plantation for *A. montana* selection at Bodja.

Besoeki Experiment Station.

Selected seed sown at Kaliwining failed owing to fungus attack and a second lot of seed had to be sent for.

Oil Palm.

Oil palm cultivation is being developed and an advisory body has been set up to give any assistance required.

Besoeki Experiment Station.

Seed has been ordered from various sources for a plantation.

Cinchona.

West Java Experiment Station.

Buitenzorg and South and West Sumatra Division.

Research was conducted on (a) chemical requirements of cinchona and (b) periodic changes in the amounts of the various alkaloids present in the bark of a cinchona tree, with observations on such changes in various clones and in a particular clone or seedling variety in different localities and under different conditions. A relation was found between alkaloid content and growth and *Helopeltis* troubles.

Out of 69 PK. clones (4-5 years old) about 20 have equalled or surpassed Tjibeureum 5 in yield. Most of these were derivatives of K.63 and RG.1 and some with good cultural characteristics have been grafted.

Another Ledgeriana clone Goenoeng Agoeng 22 (GA.22), had shown itself equal to Tjibeureum 5 in a previous test and in the present trial did well. It is, however, not quite equal to Tjibeureum 5 in cultural characteristics.

Seed from artificial pollination of Tjibeureum 5 with GA 22, planted at Penjalengan has given 1900 plants for the nursery.

Material for the formation of an Herbarium has been received for identification.

One group of 69 PK. plants in plantation 46 is theoretically important, in that the mother trees of the PK. clones were selected from a very limited number of seedlings from certain sowings, whereas usually mother trees for grafting are chosen from among dozens of seedlings of a particular sowing. The new method appears justified by the performance of the PK. clones as compared with a standard such as Tjibeureum 5.

At Tjinjireoan the possibility of self-pollination was tested with *Cinchona calysaya* and *C. officinalis*.

A large number of cinchona bark samples were analysed to determine the standard production of quinine.

The Tjinjireoan Division (the old Cinchona Experiment Station) was transferred in January 1938 to Buitenzorg. In spite of incidental difficulties and delays, work on rubber selection was energetically pursued as well as pollen studies and cytological investigations.

The new Pewaja experimental plantation was opened and 60 hectares planted with experimental material.

Rubber.

West Java Experiment Station.

Buitenzorg and South and West Sumatra Division.

The results of work at Tjiomas experimental plantation on the bisection of rubber seedlings

to obtain twin plants and reduce the cost of plant material have already been summarized (cf. "Plant Breeding Abstracts, Vol. IX, Abst. 414).

Provisional findings have been reached in experiments on pollen storage during 1937 (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 826).

In some preliminary observations no differences were found in the germination capacity of the pollen of male flowers at different positions in the inflorescence.

In the cytological study of *Hevea* Ramaer's results were followed up but newer methods of work were tried.

Root formation from buddings under certain conditions was recorded.

Observations on the mutual interaction between scion and stock were continued. Affinity and the use of stem buds instead of lateral branch buds may, it is concluded, lead to better union and a more conical form of the scion, as well as increased production. The budding may also favourably affect the production of the stock, though probably in varying degrees in the case of different clones.

The older legitimate seedling families comprising various hybrid combinations of the clones Tjir I, II, III, XVI, BD.5, BD.2, BD.10, PR.103, PR.105, 106 and 107 showed again considerable increases in yield. Marked differences in susceptibility to wind damage, brown bast disease, etc., were noted.

A number of families obtained in 1931 by crossing high producing mother trees (instead of tested clones) gave disappointing results in the first tapping year.

Material obtained by artificial cross-pollination in 1935 and 1936 was laid down on 6.95 ha. of the new Peweja experimental plantation in 1938.

The first second generation clones derived from the first legitimate families raised by the West Java Experiment Station have come into tapping and given very promising results.

Among the new plantings at Peweja were 600 second generation clones made from the tops of legitimate seedlings of the 1936 season; they are to be compared with clone PR.107.

Observations from various localities indicate that the more densely planted plots give higher yields than the less dense.

In tapping tests some 30-year old very vigorous trees originally from seedlings gave promising results in trials with double cut tapping.

Central and East Java Experiment Station.

The rapidity of growth of stocks and the mutual influence between scion and stock were investigated. Illegitimate seedlings of Limburg I ranked first in a test with other illegitimate clones such as AV.163, Limburg IV, Tjir I, etc. In another test Gondang Tapen I on its own stock apparently surpassed GD.I on illegitimate AV.50. Clone AV.50 likewise seemed to grow well on illegitimate GT.I, possibly better than on its own stock. The vigour of GT.I and AV.50 under the particular conditions did not differ much.

On two estates artificial crosses were made to obtain hybrid families in which some locally selected high yielding clones were used as one of the parents (Gondang Tapen I, Badek clones). Limburg estate did the same with the Limburg clone.

Six new seed gardens were laid down at Malang and one at Samarang. At these two centres observations on growth increases were taken.

Reports from Malaya that the progeny of Pilmoor A.44 exhibit a number of undesirable secondary characteristics led to this clone being replaced by Tjir I at Samarang.

The number of field trials under the control of the Station was extended.

Besoeki Experiment Station.

The latest views on the mutual influence between scion and stock has been summarized in "Bergcultures" (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 415).

Evidence has been obtained that cutting the tap root of plants in the beds just before transplanting makes for success.

Experiments are in progress on the promotion of new root formation by smearing the roots with solignum and on the role of growth hormones in making *Hevea* take more quickly after planting.

At Djember and Kaliwining about 16,000 artificial crosses were made during the year and the percentage set has been exceptionally good.

Yield data for selected seedlings have revealed various new promising families. PR.7 selfed has proved definitely inferior to LMOD.86 selfed, LMOD.86 x PR.7, PR.7-02 x PR.7-03, PR.2 x LMOD.55, etc.

Notes are being collected on the susceptibility of certain clones to diseases of the tapping surface and "djamoer oepas" (*Corticium*).

According to yield statistics from the test plantations in field trials Tjir I is still one of the best producers, though it shows a marked fall during the East monsoon and in this respect Tjir XVI is preferable. Pilm. B.84 is one of the best of the new clones at Kaliwining. Among the older clones in two trial plantations Tjir I, Ct.88 and AV.80 in the first year were noteworthy.

Mixed plantings are being studied and BD.5, Djas I, PB.25 and AV.188, which have small crowns and a slender habit, seem best suited for this purpose, provided they also prove to be good yielders.

Malang Agricultural Association.

The most popular clones were Tjir I, Tjir XVI, PR.107, Pilmoor B.84, Gondang Tapen I and LCB.1320; while of the improved seedling families Tjir I x Tjir XVI (and its reciprocal), PR.103 (= Bogoredjo II) x PR.105, PR.103 x PR.106 and PR.103 x PR.107 were in most demand. Tjir I selfed (from monoclonal blocks) and AV163, which is a particularly good grower and used as a stock, were also popular.

Clones and seedling families are also being grown in test plantations.

Certain clones were more resistant to bark canker than others.

In connexion with the provision of adequate planting material from split seedlings, the best method of laying out the seeds for germination was investigated (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 827).

Leucaena sp.

West Java Experiment Station.

Buitenzorg and South and West Sumatra Division.

Good results were obtained at Pasir Saronggé Experiment Station with two Lamtoro clones of the species *Leucaena pulverulenta*, characterized by scanty seed production. Under certain conditions, however, some seed is set and this species can therefore be raised from seed. (Cf. also "Plant Breeding Abstracts", Vol. XI, Absts 478 and 479).

Besoeki Experiment Station.

Special attention is still being given to the merits of new shade trees, e.g. *Leucaena pulverulenta* and a seedless *L. glauca* x *L. glabrata* hybrid. The preliminary findings on *L. pulverulenta* have been published in "Bergcultures". It appears, however, that the seedlings of *L. pulverulenta* segregate and give a high percentage of plants that flower; and the same occurs with buddings, though the percentage here is much lower.

The role of this new kind of lamtoro in controlling the white mealy bug on coffee is being examined.

Experiments on spacing were continued.

Miscellaneous.

Besoeki Experiment Station.

Among the other crops reported on by the Besoeki Experiment Station are :—

Koemis Koetjing was successfully planted between rubber.

Telfaira pedata (Oyster nut) imported from Africa by Dr. van der Veen is being grown at Djember.

Myroxylon Balsamum and *Hydnocarpus anthelmintica* have both fruited at Djember, where *Taraktogenos kurzii* has only flowered without any set of fruit.

In the report on the work at the West Java Experiment Station (Buitenzorg and South and West Sumatra Division) it is mentioned that from spontaneous seed of Dadap (*Erythrina*) on an estate at Buitenzorg, an almost thornless progeny was obtained.

316.

COSTER, C.

575:633(92)

633.912:575.127.2

Algemeene beschouwingen over selectie van overjarige gewassen. (**General considerations on selection of perennial crops**).

Bergcultures 1940 : 14 : 1328-35.

This lecture, given at a meeting of the West Java Agricultural Association and other bodies, deals with methods of selection and their applications to tropical and sub-tropical crops

and to cinchona, rubber and tea in particular. Past aims and achievements and future possibilities in regard to the expansion or intensification of research are outlined.

Referring to the work that has been done on hybrid stocks of *Hevea Spruceana* and *H. brasiliensis* (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 416), the author suggests that species crosses may be of importance in future breeding operations.

An active discussion followed, much of which was concerned with the role of artificial pollination and the use of seedlings or other planting material to rejuvenate tea plantations and with selection for quality and possible effects of environment upon it in tea.

317. HENRATH, H. 575:633:007(49.2)
In memoriam Prof. Ir C. Broekema. (In memory of Prof. C. Broekema).
Landbouw 1940 : 16 : 381-84.

An obituary notice and an appreciation of the personality and work of the former Director of the Institute for Plant Breeding at Wageningen who died on the 11th June, 1940.

318. ROBERTS, J. 575:633:578.08
A head thresher for plant breeding studies.
Agric. Engng, St Joseph, Mich. 1941 : 22 : 14, 32.

A machine, which costs about \$50 to make, for threshing small samples of wheat, sorghum and grasses is described. A cleaning attachment using a 12 in. electric fan can be made for this thresher.

319. KING, J. R. 575:633:578.08:581.162.3
Method for covering emasculated flowers in plant breeding.
Bot. Gaz. 1940 : 102 : 217-20.

A "mechanical spider," which spins a web of rubber cement, is described. It can be used for covering emasculated flowers and so making them insect-proof.

320. F, O. H. 575.061.6
Genetics and plant breeding.
Chronica Botanica 1940 : 6 : 157-58.

This is a very short account of a meeting at the 7th International Congress of Genetics to discuss plant breeding methods in the light of genetics. It is suggested that at a future Congress (or possibly at a special meeting before or after the Congress) ample time should be allotted for plant breeders and geneticists to discuss the above subject.

GENETICS 575.1

321. 575.1(47)
Genetics in the Soviet Union. Three speeches from the 1939 Conference on Genetics and Selection.
Sci. and Soc. 1940 : 4 : 183-233.

HALDANE, J. B. S.
Lysenko and genetics.
Sci. and Soc. 1940 : 4 : 433-37.

A report is given of discussions taking place at a Conference on Genetics and Breeding held in Moscow from October 7th to 14th, 1939. Much of the ground has been covered before (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 66).

Vavilov mentions the many achievements in plant breeding that have been made in other countries on the basis of genetical methods. Lysenko quotes a number of cases of segregation observed in the progeny of grafted tomatoes as evidence for the occurrence of vegetative hybridization; he also refers to the successful hybridization of *Solanum acaule* with *S. tuberosum* by first grafting the two species and performing pollinations with the flowers formed by the grafts.

In his summing up of the discussions Polyakov gives due credit to Vavilov and the so-called "formal" geneticists but acknowledges the failure of genetics to make any substantial contribution towards agricultural practice—e.g. very little of practical value has been obtained by means of induced mutation. It is concluded that success in controlling variation will only be attained through a study of the intimate relationships between the organism and environment. While conceding that for the great majority of characters controlled alteration of the reproductive elements at a given stage of development is not possible, the possibility of arriving at conditions which effect progressive changes of the genotype in the same direction

is not excluded, analogies being given from organic chemistry. Lysenko and Prezent, it is thought, have overestimated the degree of the organism's instability, Vavilov its stability, reference being made to Wettstein's petunias, Jollos' Dauermodifikation, etc. The gene is regarded as a useless concept, the Lysenko school criticized for ignoring valuable evidence from chromosome studies and for a too wholesale condemnation of mendelism, and the school of Fisher, Wright and Haldane for divorcing statistics from biological interrelations. Solidarity in genetics "can be attained only on the basis of Darwinism, elucidated and made deeper from the position of dialectical materialism".

In his reply to Lysenko's remarks J. B. S. Haldane explains from a pure genetical point of view, the variation which a pure line may undergo in later generations, the various deviations from the 3 : 1 ratio that may be expected and are in fact obtained, and the variation to be expected in F_1 generations if the parents were not pure lines. Cases where upbringing has altered the genotype are mentioned, though stated to be much rarer than Lysenko supposes. It is suggested that the morphological changes transmitted by grafting in the *Solanaceae*, mentioned by Lysenko, may be occasioned by some non-pathological virus. Instances of the use of strict mendelian segregation for purely practical purposes are given. There is also a reply to Polyakov in defence of the mathematical method of approach.

322.

575.1(47)

575.3

JAKOVLEV, P. N.

(Along Darwin's great path).

Sadovodstvo (Horticulture) 1940 : No. 6 : 18-24.

The article, which gives an outline of Michurin's life and work, contains numerous quotations from the writings of Darwin, Michurin and Lysenko in support of the view that the hereditary qualities of the progeny are influenced by the conditions of upbringing of the parents; data on vegetative hybridization too are cited from the work of these authors. The various methods used by Michurin to overcome incompatibility are referred to and a number of inter-specific and intergeneric fruit hybrids obtained by this means by the author are mentioned.

323.

575.113:001.4

576.356:001.4

The symbolizing of genes and of chromosome aberrations.

Genetica 1940 : 22 : 264-68.

The rules for symbolizing genes and chromosome aberrations drawn up by the International Union of Biological Sciences in co-operation with the International Institute of Intellectual Co-operation at Paris at a meeting held in London, August 1939. R. M. I.

324.

AZEVEDO, P. de

575.125

Ideas sobre heterosis. (Ideas on heterosis).

Palestras Agronómicas, Lisboa (1939) 1940 : 2 : 127-40.

Instances of heterosis are cited in cereals, vegetables, fruit trees and forest trees, as well as in animals, and the various existing views on the causes of heterosis are briefly outlined.

325.

SWINGLE, W. T.

575.125

Physiological implications of completely inhibited but not entirely lost characters.

Amer. J. Bot. 1940 : 27 : No. 10 Suppl. : p. 19s. (Abst.)

If two long separated species are crossed, mutual antagonism of different inhibitory systems may lead to a violent expression of some character.

326.

575.14:581.02:635.13

KOVALEVSKAJA, L. Ja.

575.14:575.3:635.15

(Overcoming the unfavourable influence of inbreeding in cross-pollinated plants).

Ovošćevodstvo (Vegetable Growing) 1940 : No. 7 : 21-25.

Whole plants of carrot when isolated in the greenhouse formed no seeds. Spatial isolation of individual plants led to the formation of a few seeds. Plants were obtained by splitting one root into a number of pieces each with an eye and when a number of such plants, each belonging therefore to the same clone, were grown in the same pot and allowed to interpollinate, 0.65 grm. of seed were obtained. When the different shoots were grown in separate pots and under different conditions of temperature and lighting and then allowed to interpollinate, 3.84 grm. of seed were obtained. When differences of soil composition and texture were

added to the differences of heating and lighting, the seed yield was 5.84 grm. Similar results were obtained with radish.

The author concludes, with Lysenko, that it is identity of nutrition and environment rather than genetic similarity that causes sterility when inbreeding is attempted in the ordinary way. Certain F_2 plants from a radish cross were cut up in the above manner and interpollinated. The plants arising from the seed obtained were compared with plants from seed obtained by open pollination of the F_2 plants and proved to be equal or superior in weight. Some of the selfed plants were again divided and interpollinated and again gave a good set of seed. Plants from this seed were compared with a local standard variety, with the two parent varieties, with plants from seed of the best open-pollinated progeny and with the F_1 and reciprocal hybrids. In root weight and earliness the selfed plants were equal to any of the others, and were distinctly better as regards uniformity of shape and colour.

327. GOLOVTSOV, L. A.

575.14:633.63

(Fifteen years inbreeding with sugarbeet).

Jarovizacija 1940 : No. 2 (29) : 62-67.

Inbreeding has led to a progressive deterioration either in yield, sugar content or both and although certain inbred lines were above the standard in sugar content they were all excessively low in yield and hence of no practical interest. By selecting always the highest yielding plants in successive generations the deterioration was diminished slightly but no line with yields at all comparable with the standard was produced in this way.

A certain amount of improvement was brought about also by intercrossing the inbred lines but the best result only gave 94.5% of the standard yield of sugar.

Not a single improved strain has been produced by the method of inbreeding and indeed the best results have been found to be those attained by combining parents differing as widely as possible in constitution.

328.

575.14:633.854.78

MOROZOV, V. K.

575.12:575.148

(Nineteen years work with sunflower by the method of inbreeding).

Jarovizacija 1940 : No. 2 (29) : 33-48.

After 20 years' work on inbreeding with sunflowers, 10 years with rye, 3 with clover and several with maize not a single variety of agricultural value has been produced. The many varied types obtained by inbreeding sunflowers are described, all being however defective and devoid of practical value. Figures are given for the yields of two varieties subjected to inbreeding over a number of generations, in each of which the most fertile plants were selected for seed; in variety No. 206 the yield fell to nil, in variety No. 169 to one third that of the open pollinated control. One generation of open pollination of the inbred lines raised the yield 2-100 times or even more. By carrying out mass selection on this material it has been possible to produce certain improved strains.

Crossing the inbred lines followed by further inbreeding has failed to produce any constant lines comparable with the standards. Most of the "synthetic varieties" produced by interpollinating a number of inbred lines were also inferior to the standard in yield and oil content. Inbreeding is thus regarded as a failure where practical results are concerned. On the other hand plants of the same variety of sunflower were collected from a number of different places and sown together so as to interpollinate. The seed so produced gave rise to plants yielding 30% more than plants from uncrossed seed.

329. ŠČERBAK, S. N.

575.14:633.854.78

(Six years of inbreeding of sunflower).

Jarovizacija 1940 : No. 2 (29) : 49-61.

Successive generations of inbred sunflowers belonging to a number of different varieties have shown great deterioration in yield, which suffered especially in unfavourable years. Another characteristic of the inbred lines was the much reduced production of nectar, which resulted in the visits of bees being much less frequent. Reduction was observed too in the 1000 seed weight; the husk percentage was first reduced and then in later inbred generations again increased owing to the reduction in seed contents. The lower husk percentage is attributed to debility, since it is associated with a general reduction in the strength of the mechanical tissue. The oil content rose in some families and fell in others.

Rust resistance was increased in a number of inbred lines but these were defective in many

other respects such as resistance to *Verticillium*, a tendency to shedding, small seeds, low fertility and poor yield.

The inbred lines were later in maturity, lower in germination capacity and had smaller inflorescences.

By crossing inbred lines yields varying from 96.6 to 103.7% of the yield of the original unselfed population were obtained. Much higher yields were given by hybrids between two different varieties. These fell again in the F_2 , although some of them were still somewhat higher than the standard. Crosses between rust resistant inbred lines were low in yield and crosses of these lines with other varieties were not resistant.

It is concluded that none of the results of inbreeding are such as to justify it as a method of breeding.

CYTOLOGY 576.3

330. BERGER, C. A. 576.312.34:576.312.315
SAT-chromosomes.
 Science 1940 : 92 : 380-81.

Readers are reminded that the letters SAT in Heitz's term "SAT-Chromosome" stand for "Sine Acido Thymonucleinico". The term applies to all satellited chromosomes and to those secondarily constricted chromosomes which are concerned in the origin of the nucleolus, that is to say, in general it applies to chromosomes associated with the formation of the nucleolus.

331. SATÔ, D. 576.312.34:576.312.315:576.35
(Recent research on nucleolus-chromosomes in plants. Parts 1 and 2).

Bot. and Zool. 1937 : 5 : 817-24, 991-96.

This is a review of the work that has been done by investigators in various countries and by the author on the problems pertaining to nucleolar chromosomes, Sat chromosomes, the nucleolus and the relation between the Sat chromosome hypothesis and karyotype analysis.

332. EIGSTI, O. J. 576.35:581.04
A preliminary study of the effects of certain organic substances upon cell division.

Amer. J. Bot. 1940 : 27 : No. 10 Suppl. : 14s-15s. (Abst.)

The effects of various hormones, drugs and other biologically active substances on the pollen tube division of *Tradescantia* were studied. All the substances influenced cell division. Mitotic irregularities were induced by tryptophane, sulfanilamide, colchicine, adrenalin and prolactin.

333. HAGA, T. 576.354.46:519.24
(A statistical analysis of the chiasma formation).
 Jap. J. Genet. 1939 : 15 : 308-10.

Mathematical formulae for determining chiasma frequencies are presented. Some of the results appear to challenge the partial chiasma theory.

334. MARSHAK, A. 576.356:537.531:581.04:635.25
 537.531:635.651

Alteration of chromosome sensitivity to X-rays with NH_4OH .

Proc. Soc. Exp. Biol., N.Y. 1938 : 38 : 705-13.

Previous treatment with an atmosphere of 80% carbon dioxide or with smaller carbon dioxide concentration had no effect on the number of abnormal anaphases observed in the root tips of *Allium Cepa* after X-ray irradiation. Concentrations of ammonium hydroxide, which by themselves produced no effect on the numbers of abnormal anaphases observed in root tips of *A. Cepa* and *Vicia Faba*, were found to reduce considerably the number of abnormal anaphases produced by X-rays. This is explained as being due to the ammonia causing an alteration in the positively charged materials of the chromosomes and it fits in with previous experiments which had led the author to believe that the production of chromosome abnormalities by X-rays is due to the action of electrons on these positively charged materials. At high concentrations ammonia itself produces very many abnormal anaphases.

335. MARTIN, J. N. 576.356.5:576.12
The chromosome and the origin of species.

Proc. Ia Acad. Sci. (1939) 1940 : 46 : 49-58.

A general account with special reference to polyploidy.

336. DERMEN, H. 576.356.5:577.17:581.04

Hormonal polyploidy in plants.

Amer. J. Bot. 1940 : 27 : No. 10 Suppl. : p. 14s. (Abst.)

Application of 0.25% naphthalene acetic acid in lanolin paste to the internodes of bean plants produced tumours. Cytological examination showed that it also induced chromosome doubling, which was apparently repeated as many as 4 or 5 times.

337. CASTRO, D. DE 576.356.5:581.04

A colchicina na indução de poliplóides. (Colchicine in the induction of polyploids).

Palestras Agronómicas, Lisboa (1939) 1940 : 2 : 141-55.

The characteristic features of polyploid plants are described and the various methods of inducing them discussed, with an account of the events which led up to and have followed upon the discovery of the use of colchicine.

338. CASTRO, D. DE 576.356.5:581.04

633.1:576.356.52

Alguns efeitos da colchicina. (Certain effects of colchicine).

Agron. Lusitana 1940 : 2 : 91-103.

The work of previous authors is reviewed.

Grains of barley, wheat and oats were treated with colchicine solutions of various concentrations. The coleoptile and early leaves were very much swollen but neither the resulting plants nor their progeny showed any signs of polyploidy. One haploid was obtained in the F_2 from a treated plant of the tetraploid wheat Rubião.

The absence of polyploids is thought to be due to the failure of the solution to penetrate to the growing point and attempts are to be made to overcome this defect.

339. ONO, T. 576.356.5:581.04:576.312.332

(Induced polyploidy in some dioecious plants).

Jap. J. Genet. 1939 : 15 : 319-21.

Induced polyploidy following treatment with colchicine is being studied in species of *Melandrium*, *Humulus* and *Rumex* and in *Cannabis sativa*, *Spinacia oleracea*, *Fragaria elatior* and *Asparagus officinalis*. Though the resultant polyploids varied more or less according to the plant treated, all had stout stems, broad, thick and dark coloured leaves and other common features of polyploidy.

The present paper is concerned with the cytological aspect of the sex chromosomes of *Melandrium* and their size in particular.

340. BOWDEN, W. M. 576.356.5:632.111-1.521.6

The chromosome complement and its relationship to cold resistance in the higher plants.

Chronica Botanica 1940 : 6 : 123-25.

BOWDEN, W. M.

Chromosome studies in tropical, subtropical, and temperate zone plants with reference to polyploidy and winter hardiness.

Genetics 1941 : 26 : 140-41. (Abst.)

These two notes state that an increase in chromosome number does not necessarily mean an increase in winter-hardiness since tetraploid species are either more hardy, less hardy or of the same degree of hardiness as related diploid species. It is also pointed out that in many cases winter-hardiness and frost resistance have been found to be controlled by only a few pairs of genes (for a previous and similar article by the same author see "Plant Breeding Abstracts", Vol. XI, Abst. 97).

QUALITY 581.6

341. KNIAGINICHEV, M. I. 581.6:578.08:581.192

(Biochemical variation and its significance in breeding food crops).

Soviet Plant Industry Record 1940 : No. 1 : 89-103.

Variations have been observed in protein content in wheat grains according to position in the ear, etc., and similar differences in composition have been found in the seeds, roots, tubers, etc., of other cultivated plants. Differences from plant to plant have also been observed, even within pure-bred varieties. There would appear therefore to be considerable possibilities

for improvement even in such varieties by selecting outstanding individuals. Varieties differ in their reaction to manuring, locality, etc., and this must be taken into consideration in comparing hybrid lines. Data for these are of real value only if they consist of comparisons with the parental forms grown as nearly as possible under the same conditions and over a number of years.

PLANT DISEASES 632*

342. WOTCHAL, A. E. 632.112-1.521.6:578.08
(Physiological bases of the resistance of plants to hot, dry winds.
Artificial dry-wind apparatus and methods of work).
Soviet Plant Industry Record 1940 : No. 1 : 63-70.

A new type of chamber is described, in which the atmospheric humidity, the temperature and the velocity of the air current can be controlled independently; the walls are of glass like a greenhouse.

343. OLIVEIRA, B. d' 632.452:576.16
633.1-2.452-1.521.6:575
Aspectos actuais do problema das ferrugens. (**Present aspects of the
rust problem**).
Palestras Agronómicas, Lisboa (1939) 1940 : 2 : 5-77.

The concept of the species as applied to the rust fungi is discussed and an outline is given of the existing knowledge on physiological forms, the factors affecting their reaction, mutations and the phenomena related to them being given special attention. The author reports the discovery of a mutant in one of his cultures of *Uromyces Fabae*, the mutant having submerged sori and sterile or almost sterile mycelia. Colour mutations in *Puccinia anomala* have also been observed, some accompanied by changes in pathogenicity; they occurred only when the rust was on one particular strain of barley (*Hordeum vulgare pallidum*). It is thought that the function of certain forms as bridging hosts may be attributed to their capacity to induce mutation.

The author has also done work on hybridization in the rust fungi, in confirmation of Craigie and other workers, whose results are reviewed. He has evidence that the rust fungi are capable of fixing atmospheric nitrogen, which may have a close bearing upon the phenomenon of physiological specialization.

The article ends with a discussion of the possibilities of breeding resistant varieties, with emphasis on the complexity of the problem, citing as an example the production of Thatcher wheat by the combined efforts of a team of 19 people.

344. VALLEGA, J. 632.452:576.16:633.11(82+83+89)
633.11-2.452-1.521.6:575
Especialización fisiológica de *Puccinia graminis tritici* en la Argentina, Chile y Uruguay. (**Physiological specialization of *P. graminis tritici* in Argentina, Chile and Uruguay**).
Rev. Argent. Agron. 1940 : 7 : 196-220.

The reaction of the host to the parasite is influenced by external factors such as light; this has been clearly demonstrated for race 42 on Khapli wheat. Indications are given, on the basis of the first year's results, of the distribution of the various races in the countries concerned. The reaction of the principal local wheat varieties is discussed. Some of them are resistant to certain physiological forms and among the hybrids from the cross Heines Kolben x 38M.A. there appear forms resistant to the most common races, 11, 17 and 42, and also to race 14.

ECONOMIC PLANTS 633

345. De Commissie voor de Handelsgewassen. 633-1.524(92)
(**The Committee for Industrial
Plants**).
Bergcultures 1940 : 14 : p. 1291.

The aims and functions of this new committee established in the Netherlands East Indies are to examine the prospects and to promote and develop the introduction and cultivation of new plants of economic value. In addition to the collection of suitable indigenous material

* See also Abst. 315 (Derris).

and its evaluation by laboratory research, the committee will also undertake the planning and financing of study tours and explorations abroad—especially in the tropics and sub-tropics.

WHEAT 633.11

346. FLAKSBERGER, K. A. 633.11:575(47)
(**Origin of the wheat *Batetskaja*.**)

Soviet Plant Industry Record 1940 : No. 1 : p. 105.

The wheat in question is shown to be in reality the variety Tulun 70B/8 which has been selected from a population in which it was present as an impurity.

347. SHULYNDIN, A. 633.11:575.12
(**On choosing the mother plant in hybridization).**)

Soviet Plant Industry Record 1940 : No. 1 : 50–57.

The author states that none of the successful plant breeders of the world have used Mendelian principles, and that Morgan's statement that "reciprocal hybrids are as a rule identical" is incorrect, being in conflict with the views expressed by Michurin.

Reciprocal crosses were made between two local winter wheats of the Leningrad region on the one hand and two semi-winter wheats from China and Italy respectively on the other. No clear differences were observed between the reciprocal F_1 's and they are not described. In the F_2 generation the families giving the best survival were those in which the Leningrad wheats had been used as maternal parents, especially good F_2 families being produced from the earlier of the two varieties. These families also had a higher proportion of early maturing forms; the number of grains per ear and the grain weight were higher in the F_2 families from crosses with the Southern forms as female parent. Differences between the reciprocal F_2 's were observed also in respect of rapidity of growth, beginning of tillering, size of leaves, height of plant, resistance to diseases, etc., mostly in favour of the families with the Leningrad varieties as maternal parent. As regards protein content very little difference was observed. Crosses between the spring wheat *Lutescens* 062 and the winter *Stahlweizen* were quite normal but the F_1 of the reciprocal, where *Stahlweizen* served as the maternal form, died out completely at the tillering stage.

348. BASSARSKAJA, M. A.,
ERMOLAEVA, N. I. and
KHOD'KOV, L. E. 633.11:575.12:575.148
(**Description of wheat plants obtained from seed of intravarietal crosses).**)

Jarovizacija 1940 : No. 1 (28) : 23–26.

Seeds from intravarietal wheat crosses germinated more quickly and uniformly, giving more vigorous seedlings, which had a higher chlorophyll content.

349. KROTOV, A. S. 633.11:575.12:575.148
(**On improving self-pollinated varieties).**)

Soviet Plant Industry Record 1940 : No. 1 : 22–26.

Comparisons were made between ears of wheat emasculated and pollinated with a mixture of pollen of the same variety, ears not emasculated and pollinated with a mixture of pollen, and controls inbred by isolating under parchment bags. The largest yield of grain was obtained from the first series and the next largest from the second series. The progeny of each plant was sown separately and yield comparisons in the third generation showed great variation between the progenies of different plants.

Similar results were obtained in the following year, the best progenies being obtained from ears emasculated and left to pollinate by the wind. Grain from plants grown under favourable conditions of manuring and spacing gave progenies with better yields than normal, and the difference was especially marked when dealing with plants obtained by intravarietal crossing.

350. MATSUMURA, S. 633.11:575.127.2:581.331.2:581.162.4
Weitere Untersuchungen über die pentaploiden *Triticum*-Bastarde X.
Kreuzungsversuche mit gemischtem Pollen. (**Further investigations on the pentaploid *Triticum* hybrids. X. Crossing experiments with mixed pollen).**)

Jap. J. Bot. 1940 : 10 : 477–87.

Germination tests made with pollen of *T. polonicum*, *T. Spelta* and the hybrid *T. polonicum* x

T. Spelta and with mixed pollen from the two species upon the stigmas of *T. polonicum*, *T. Spelta* and F_1 hybrid showed that *T. Spelta* pollen gave a much higher germination percentage on the various stigmas than *T. polonicum*.

In the mixtures the larger grains (possibly from *T. Spelta*) were superior in germination to the smaller grains (possibly from *T. polonicum*), while the hybrid pollen showed low germination and the larger grains were more effective than the smaller ones.

From experiments on the relative effectiveness of pollen from the two species (as tested by pollen mixtures in different proportions) it is concluded that the fertilization capacity of *T. Spelta* is about 10-17 times as great as that of *T. polonicum*—which confirms the former conclusions, already reviewed (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 105). A supplementary experiment with a mixture of pollen from *T. durum* and *T. vulgare* in addition to the two species already mentioned gave similar results and were in agreement with previous findings (cf. "Plant Breeding Abstracts", Vol. X, Abst. 104).

351. HUSKINS, C. L. and
SMITH, S. G.

633.11:575.242

Compactoid and speltoid mutations in *Triticum vulgare*.

Collecting Net 1940 : 15 : p. 171. (Abst.)

The normal phenotype of *T. vulgare* is determined by a balance between ear-lengthening and speltoid glume factors (chromosome location unknown) and compacting and round glume factors (borne on the long arm of the C-chromosome). Deficiency or duplications of the C-chromosome (or certain parts of it) modify the phenotype in the speltoid or compactoid direction respectively.

352. SEARS, E. R.

633.11:576.356.4

Nullisomics in *Triticum vulgare*.

Genetics 1941 : 26 : 167-68. (Abst.)

Seven nullisomics ($2n - 2$) have been obtained from sixteen monosomics found in the progeny of a haploid pollinated by a diploid in *T. vulgare* ($n = 21$). In five of the nullisomics the missing chromosome is homologous with a chromosome of the emmer wheats, while in the other two all 14 emmer homologues are present. Short descriptions of the nullisomics are given. Additional monosomics are easily obtained from nullisomic III which is partially asynaptic.

353. KAGAWA, F.

633.11:576.356.5:581.143.32:581.036

(High temperature treatments in *Triticum* and the character and chromosomes of the next generation).

Proc. Crop. Sci. Soc. Japan 1940 : 12 : 90-93.

High temperature treatments applied to 18 plants representing 2 strains of *T. compactum* gave 7 abnormal plants and 608 normals in the next generation. Among the anomalies produced was a complex chimaera which had 2 kinds of abnormal panicles as well as a normal one. One kind was much longer than the normal and a cell from a root tip under the tiller bearing this panicle had $2n = 28$ chromosomes. The other kind of panicle was intermediate between the normal and the long one. These abnormalities were associated with total sterility or very low fertility. The normal panicle on close examination showed a few signs of anomalies.

Another plant which was taller than the normal and had larger leaves and panicles had $2n = 33$ and looked like a tetraploid. Fertility was not very low. The giant type may possibly be attributed to elimination of chromosomes in the C genom.

Another heteroploid plant with $2n - 34$ chromosomes had glumes which were red except for their margins. If this anomaly is not due to mutation it must be due to elimination of one or more chromosomes and the resultant loss of one or more genes inhibiting anthocyanin production.

From a study of the aberrant forms obtained, the author suggests that fertility is not directly related to chromosome number, nor with morphological differences in the panicle; fertility and morphological characters depend as a rule on the number and kind of chromosomes eliminated.

High temperature treatment of a variety Akasabi-Shirazu of *T. vulgare* gave no abnormal plants, probably because of differences between the species in their reaction.

354. ŠINAREV, I. T.

633.11:581.162.32

(Natural hybrids and their progeny).

Jarovizacija 1940 : No. 1 (29) : 100-01.

Awnless red-eared wheats appearing among a population of Caesium 0111 are thought to be natural hybrids with Milturum 0321 or Kommunarka. They segregated in a manner referred to as "non-mendelian" in later generations. They are possessed of a number of features of practical interest and are being used for breeding.

355. MIKHAILOV, G.

633.11:581.162.32:578.08

(Improvement of the technique of crossing wheat).

Rev. Inst. Rech. Agron. Bulg. 1937 : 7 : No. 1 : 27-43; 1938 : 8 : No. 2 : 63-86.

In view of the need for large numbers of F_2 plants in analysing the polymeric gene action underlying many of the economic characters of wheat and in hybridizing distantly related species, such as *T. durum* and *T. vulgare*, or different geographical races, a satisfactory technique of emasculation and pollination is essential. Extensive experiments have been made at the Obratzov Experiment Farm in Bulgaria to test the importance of emasculation and isolation (separately or combined), time of removal of bags and the extent of cross-pollination in determining the set from crosses between Noe wheat (*Triticum vulgare* var. *lutescens*) and a strain No. 16 (*T. vulgare* var. *ferrugineum*) used as pollinator.

The results showed a marked reduction in fertilization due to bagging. Emasculated flowers that were neither isolated nor pollinated showed a set of 40.7% a rather high figure for cross-pollination which is attributed to the actual operation of emasculation in which the paleae are separated and thus give freer access to drifting pollen. Furthermore it was evident that the bad effect of isolation is particularly marked after pollination, i.e. on the actual process of fertilization, and that for practical purposes the ill effects can be considerably reduced by removing the covering on the inflorescences immediately after pollination.

One series of crosses showed in F_1 dominance of awnlessness (from *T. vulgare* var. *lutescens*) and red ear (from No. 16). For genetical studies, however, bagging is necessary.

Further experimentation with *T. vulgare* and *T. durum* crosses showed that the amount of cross-pollination was not directly proportional to the degree of expansion of the paleae after emasculation. Varietal differences were found in the type of paleae and their expansion after emasculation and also in the consequent effects of atmospheric conditions upon the stigma.

Weather conditions had little influence upon the results.

The foregoing findings and others arrived at by similar experiments in 1936 and 1937 could be applied to improving the technique of hybridization at the Obratzov Farm and elsewhere in Bulgaria.

A simplification of the method which could be used where a high set is desired in crossing two suitable varieties grown together in isolation is suggested as the result of an experiment made in 1937 on cross-pollination in wheat (and in rye).

Rye of strain No. 59 and wheat of the variety Noe were used to determine (1) the distance to which pollen may be carried in the air and (2) the length of time for which the fertilizing capacity of the pollen is retained.

The results showed that, while the rye pollen was effective (with a set of 30%) at 200 metres or more, the wheat pollen gave a set of only 1.6% at 50 metres and none at greater distances.

The author concludes that hybridization in wheat is possible only between varieties and species in the vicinity of each other.

A small experiment on similar lines with soft wheats and one *T. durum* form No. 0107 further demonstrated the ill effects of the isolator; and indirectly the high percentage (90%) of cross-pollination in the case of the *T. durum* threw light on the causes of "reversion" in the *T. durum* forms in Bulgaria. The relative proportions of cross-pollination from the pollen from the *T. durum* and from the soft wheats were to be determined in 1937.

Further experiments with the variety Noe aimed at increasing the number of flowers pollinated and at the same time determining the most favourable day and hour for pollination after emasculation. The results of the second experiment showed that the greatest number of fertilized flowers was obtained when pollination was performed at 8.30-9 a.m., and the fewest with pollination at about 5 p.m. The number of seeds set rose again after pollination at 8 p.m. The highest percentage set was obtained from pollination on the sixth day after emasculation though no definite trend was evident from the results as a whole.

This investigation was again pursued in 1936 and 1937 and in both years it appeared that between 28th May and the 5th June pollination was approximately equally successful on any day after emasculation. Incidentally, it is recorded that the stigma may remain receptive even 10 days after emasculation—a fact to be noted by both plant breeders and geneticists. As regards the most favourable hour for pollination, the previous findings were confirmed by the results for 1936 and 1937.

356. S , M. 633.11:581.481
(Cytology of twin-embryoed plants).
 Bot. and Zool. 1937 : 5 : p. 146.

A note on the cytology of twin and other multiple-embryo wheat plants. When reared separately the twin plants were found to include a haploid with a diploid, or a diploid with a triploid or a tetraploid. One "triplet" wheat comprised a diploid and two triploids. The value of such plants for breeding purposes is mentioned.

357. SAVOFF, C. 633.11:582(49.7)
 633.11:581.9(49.7)
 Contribution sur l'étude des blés Bulgares. **(Contribution to the study of Bulgarian wheats).**
 Rev. Inst. Rech. Agron. Bulg. 1937 : 7 : No. 1 : 45–67.

After visiting various wheat regions throughout Bulgaria, the author has surveyed the distribution of the various wheat species and populations in the country with descriptions of varieties of the following species and notes on their biological characteristics as well as the chemical composition and some physical features of their grain : *Triticum vulgare*, *T. durum* and *T. turgidum*.

Among the most widespread wheats of the region are *T. vulgare* var. *erythrospermum* Körn. and var. *ferrugineum* All. The endemic varieties include : *T. vulgare* var. *nigroaristatum* Flaksb.; var. *erythroleucon* Körn.; *T. durum* var. *africanum* Körn.; var. *fastuosum* Lag.; and *T. turgidum* var. *speciosissimum* Körn., var. *buccale* All. and var. *rubroatrum* Körn. Some notes on the baking quality and flour of some of the soft and hard wheats are appended.

358. PANČENKO, N. P. 633.11–1.524(47)
(Varieties of winter wheat for the Leningrad region).
 Soviet Plant Industry Record 1940 : No. 1 : p. 104.

The two best hardy winter wheats are two local varieties which have yielded 14.35 and 14.27 c. per ha. as an average for the two last years, as compared with 11.36 for the standard variety, Durable. One of the varieties, Peredskaja, is free from shedding and lodging, with large grains and high baking quality.

359. 633.11–1.524:575.3(49.7)
(Regionalization of new wheat varieties in Bulgaria).
 Rev. Inst. Rech. Agron. Bulg. 1937 : 7 (4) : 95–100.

Since 1931 Bulgarian experiment stations have been carrying out extensive regional wheat trials in the most important regions of the country to ascertain which varieties are best suited to particular localities and a committee, set up by the Bulgarian Ministry of Agriculture, has on the basis of the information thus accumulated formulated a systematic plan for the future distribution of new varieties, with also a map giving exact indications of the regions suitable for each variety.

The varieties recommended for various localities in seven different regions are tabulated and the replacement of existing varieties, by improved ones is to be the future official policy.

360. TIMOFEEVA-TYULINA, M. 633.11–2.111–1.521.6:575.3
(Training of plants a potent means of increasing the hardiness of winter wheat).
 Soviet Plant Industry Record 1940 : No. 1 : 37–39.

The conditions under which plants were grown influenced the hardiness not only of the plants themselves but of their progeny too.

361. *ROGANOVIĆ, B. 633.11-2.112-1.521.6(49.7)
(The influence of precipitation on the cultivation of wheat in southern Serbia).

Arhiv Minist. Poljopr. 1936 : 3 : No. 5 : 90-116.

Having discussed the climatic factors of southern Serbia in relation to wheat growing, the results of a study of the wheats of the region are recorded.

The various botanical varieties and selections from them exhibit differences in resistance to drought.

Among the *Triticum durum* Desf. forms the most drought resistant have proved to be those with small ears and in particular (1) all races of the variety *coerulescens* with small blue-black ears and white grain—the “Crnoklasa” [= Black Ear] or “Karabašak” types as they are termed in some parts—and (2) races of the variety *libycum*. Another wheat of this group which has given good results in dry years is *melanopus* which does well in pure and in mixed populations in southern Serbia.

In the *vulgare* group the greatest resistance has been found mainly in the sub-group *muticum* and the variety *albidum* in particular which, in populations and selections, in drought years have during growth and earing been 30 cm. taller than other types and have had a 100 grain weight of 3.7-4.5 gm.

In the sub-group *aristatum* the *graecum* wheats have shown the best results as regards drought resistance, accompanied by normal development, size and plumpness of the grain whose weight per 100 was 4.2-5 gm.

Of the wheats *ferrugineum* and *erythrospermum* the latter have proved the more resistant: the main botanical and economic features of the most resistant are described. They include both early and late forms and they withstand drought and cold excellently. In wet years, however, they tiller excessively and lodge and therefore give low yields.

Similarly some specimens of the varieties *nigroaristatum* Flaksb. and *Sardoum* Körn. have shown fairly high drought resistance.

Summing up, it is evident that the greatest drought resistance is exhibited by the white grained hard and soft wheats, of which the most widely distributed, especially in the northern part of the area in question, are *hordeiforme*, *melanopus* and *coerulescens*.

Local southern Serbian wheats give relatively stable yields even with variations in the April rainfall and this characteristic is displayed by the local varieties that have been selected for drought resistance and earliness.

362. VALLEGA, J. 633.11-2.452-1.521.6:575(82)
 Dos nuevas selecciones de trigo de origen híbrido inmunes a “*Puccinia glumarum*”. **(Two new wheat selections of hybrid origin immune to *P. glumarum*).**

Rev. Fac. Agron. La Plata 1937 : 22 : 139-45.

P. glumarum has only recently become extensive in Argentina. Form 30 is the chief, but there are indications that other forms are also present. The wheat Chino 166 is immune to this form and to forms 37 and 38, which are present in Chile, and was crossed with Lin Calel in 1929. Rigid selection was carried out in each generation from the F_2 onwards and in 1937 two selections had proved outstanding, being immune to *P. glumarum*, both in the field and under artificial infection; they are winter forms, somewhat earlier than Lin Calel. One of the selections, I.F.301, is equal to Lin Calel in baking quality, the other, I.F.293, is slightly inferior. They both yield considerably more than Lin Calel and have even surpassed La Previsión 25.

363. PAINTER, R. H.,
 JONES, E. T.,
 JOHNSTON, C. O. and 633.11-2.7-1.521.6:575
 PARKER, J. H. 633.11-2-1.521.6:575

Transference of Hessian fly resistance and other characteristics of Marquillo spring wheat to winter wheat.

Tech. Bull. Kans. Agric. Exp. Sta. 1940 : No. 49 : Pp. 55.

The spring wheat Marquillo derived from a cross between the *vulgare* wheat Marquis and the *durum* wheat Iumillo has inherited the resistance of the latter to Hessian fly (*Phytophaga*

destructor) and is resistant moreover in both the hard and soft wheat belts of the U.S.A. The present paper describes in detail the transference of this resistance to winter wheat and its combination with resistance to leaf rust, stem rust, bunt and mildew and tolerance to jointworm (*Harmolita tritici*).

The winter wheats used were Tenmarq, Minturki, Oro, Kawvale and a selection of Kanred x Hard Federation. Further crosses have also been made with other wheats. The resistance of Marquillo was recessive, but apparently due to more than one factor. There was no evidence of association between resistance to fly and resistance to disease, winter-hardiness, spring or winter habit or other agronomic characters observed.

Among the many interesting features of this important piece of work is the point that owing to fly resistance being recessive stringent selection for this character had to be left to the later generations.

As a result of the work promising strains of hard red winter wheat combining the desirable features mentioned above are available for the first time and they are moreover the first winter wheats to show marked resistance to Hessian fly in both the hard and soft wheat belts wherever so far tested.

364. NOBLE, W. B.,
CARTWRIGHT, W. B. and
SUNESON, C. A.

633.11-2.7-1.521.6:575.11

Inheritance of resistance to hessian fly.

J. Econ. Ent. 1940 : 33 : 580-81.

A resistance to Hessian fly less pronounced than that of the variety Dawson (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 183) occurs in some wheat varieties and strains of the Java type. Two strains, Illinois No. 1 W38 and Illinois No. 1 x (Norka x Carina), which show this type of resistance, have been crossed with Dawson and the percentage of fly infestation of the F_2 and F_3 hybrids has been studied. The data indicate that Ill. No. 1 W38 and Ill. No. 1 x (Norka x Carina) differ from Dawson by at least one factor for fly resistance.

OATS 633.13

365. HUSKINS, C. L.,
SANDER, G. F. and
LOVE, R. M.

633.13:575.242

Chromosome mutations in *Avena*.

Collecting Net 1940 : 15 : 170-71. (Abst.)

The steriloid, fatuoid and sub-fatuoid mutations in *A. sativa* var. Banner and in *A. byzantina* var. Kanota are due to the removal of the wild-type inhibitors by partial or complete loss of the long arm of the C-chromosome. This chromosome also carries factors affecting synapsis and the growth and viability of the plant.

366. BRANDWEIN, P. F.

633.13-2.451.2-1.521.6

Infection studies on the covered smut of oats.

Bull. Torrey Bot. Cl. 1940 : 67 : 673-91.

The infection of Monarch (highly susceptible), Black Mesdag (moderately susceptible) and Markton (resistant) oats by the covered smut, *Ustilago levis*, was studied under controlled environmental conditions. The resistance of the Markton oat to infection cannot be explained on the basis of the growth rate of seedlings and is probably due to a specific internal factor unfavourable to the development of the smut fungus.

367. MURPHY, H. C.,
BURNETT, L. C.,
KINGSOLVER, C. H.,
STANTON, T. R. and
COFFMAN, F. A.

633.13-2.452-1.557:519.241.1

633.13-2.452-1.521.6

Relation of crown-rust infection to yield, test weight, and lodging of oats.

Phytopathology 1940 : 30 : 808-19.

Data were obtained on the percentage and type of crown rust infection, degree of lodging, date of ripening, height, grain yield and test weight for 442 varieties and selections of oats.

Particular attention was paid to the correlations between crown rust infection and yield and between crown rust infection and test weight.

Many of the varieties and selections grown were selections from crosses between high yielding, stem rust resistant varieties such as Richland, Iogold and Rainbow and the crown rust resistant and smut resistant varieties, Victoria and Bond. Markton was also used as a source of smut resistance. The breeding methods used with some of the crosses have been previously described (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 227 and Abst. 713, and Vol. VII, Abst. 189).

All the correlations between crown rust infection and yield and between crown rust infection and test weight were highly negative and highly significant. Regression coefficients were also calculated.

For each unit increase in the coefficient of crown rust infection, the yield was decreased on an average by 0.40 to 0.47 bushels per acre—coefficients of crown rust infection varied from 0 in some Bond hybrids to 91–100 in very susceptible types, many standard varieties having a coefficient of 61–70. Correlations between crown rust infection and ripening date, height and degree of lodging were not significant.

The performances of the Bond hybrids demonstrated the value of that variety as a source of resistance to crown rust. Selections from the cross Victoria x Richland are highly promising as having resistance to stem rust, loose smut, covered smut and crown rust and as being also high yielders. One selection from this cross, C.I.3305, has recently been distributed under the name of Boone. Selections from the cross Markton x Rainbow are also promising for similar reasons and two of these (C.I.3247 and 3346) have been recently distributed as Marion and Hancock (cf. "Plant Breeding Abstracts", Vol. X, Abst. 413). Selections with resistance to crown rust were also obtained from crosses involving Victoria and in a few cases from crosses in which none of the parents was resistant to crownrust. All selections from the cross Markton x Iogold (both parents susceptible to crownrust) were more or less susceptible.

RYE 633.14

368. VASCONCELLOS, J. de Carvalho e 633.14:575(46.9)
Considerações acerca do melhoramento do centeio. (**Considerations
regarding the improvement of rye**).
Minist. Agric., Direc. Ger. Serv. Agric., Belem 1940 : No. 12 : Sér. Estud.
Inform. Téc. : Pp. 26.

Brief notes are given on the origin, cytology, pollination and botanical varieties of *Secale*; tables are given showing a number of existing correlations and characters whose inheritance has been determined. The various characters to be aimed at in breeding are enumerated and the different breeding methods are described. Mass selection is recommended for rye improvement in Portugal.

369. SHCHERBINA, D. R. 633.14:581.162.32
(**On the artificial pollination of winter-rye**).
Soviet Plant Industry Record 1940 : No. 1 : 35–36.

Artificial pollination resulted in both an increase in yield and 1000 corn weight as well as a reduction in the proportion of sterile spikelets in the variety DS-2 as compared with the control left to pollinate freely in the ordinary way.

370. KONDRATENKO, F. 633.14–2.111–1.521.6:581.143.26.03
(**Analysis of population of winter-rye according to length of
vernalization stage**).
Soviet Plant Industry Record 1940 : No. 1 : 27–34.

Partial vernalization revealed differences between the individuals of a given variety in respect of the length of their vernalization period as well as differences between the different varieties. It would be quite possible in this way to select lines with the longest vernalization period, so as to raise the winter-hardiness. The association of hardiness with a long vernalization phase is demonstrated once again by a series of experiments with rye.

371. MILLER, E. S. and
JOHNSON, I. J. 633.15:575.061.634
Inheritance of chlorophyll in F_1 crosses made reciprocally between selfed lines of corn.

Proc. Soc. Exp. Biol., N.Y. 1940 : 44 : 26-28.

Percentage total chlorophyll and mg. of total chlorophyll per 100 sq. cm. of leaf tissue were determined in fifteen reciprocal crosses between high and low chlorophyll inbred lines of maize. The results showed that the male and female parents each contribute equally to the genotype of the F_1 cross in respect of chlorophyll concentration.

372. SPRAGUE, G. F. 633.15:575.125:575.115
The location of dominant favorable genes in maize by means of an inversion.

Genetics 1941 : 26 : p. 170. (Abst.)

A stock homozygous for a 5th chromosome inversion (including the *pr* locus) was crossed with an inbred dent corn line carrying the *Pr* gene. The F_1 plants were back-crossed to the inversion stock and the resulting seeds separated into those with red (*pr*) and those with purple (*Pr*) aleurone colours. Using these seeds, comparisons were then made of the dominant favourable factors in the normal and inverted segments. No significant differences were found for plant or ear height, number of ears per plot, kernel row number or moisture content. In some cases dominant favourable factors were found to have been contributed by the dent corn inbred parent.

373. ROBBINS, W. J. 633.15:575.125:577.17
Growth substances in a hybrid corn and its parents.

Bull. Torrey Bot. Cl. 1940 : 67 : 565-74.

The thiamin, factor Z and biotin concentrations in the extracts of partially germinated grains of a hybrid maize and of its inbred parents (WF 9 and 38-11, both developed at the Indiana Agricultural Experiment Station) were determined by the effect of the extracts on the growth of *Phycomyces Blakesleanus* in a medium containing no thiamin, of *Phycomyces* in a medium containing excess thiamin and of *Ashbya Gossypii* in the absence of biotin respectively. The thiamin and biotin concentrations do not appear to be of importance in explaining heterosis, the concentrations of these two substances in hybrid embryos and endosperms being either intermediate or lower than the two parental concentrations. On the other hand the concentration of factor Z in hybrid embryos and endosperms is higher than the concentrations in those of either parent and it may be that the growth of both hybrids and parents is limited by the quantity of factor Z which each synthesizes.

374. MILLANG, A. and
SPRAGUE, G. F. 633.15:575.125:578.08
The use of punched card equipment in predicting the performance of corn double crosses.

J. Amer. Soc. Agron. 1940 : 32 : 815-16.

The labour involved in using Jenkins's method B of calculating the yield of a double-cross maize hybrid [e.g. (a x b) x (c x d)] from the yields of the four single crosses (a x c, a x d, b x c and b x d) not entering into it can be reduced by the use of punched card equipment. In this note an account is given of the procedure adopted at Ames, Iowa.

375. COPELAND, F. C. 633.15:575.125:581.141
Growth rates in inbred and hybrid corn embryos.

Collecting Net 1940 : 15 : p. 169. (Abst.)

Hybrid maize embryos already showed hybrid vigour at from four to ten days of growth. This difference in growth rate at such an early stage is sufficient to account for the larger size of mature hybrid embryos.

376. TAVČAR, A. 633.15:575.125:581.43
Heteroza korijenja mladih kukuruznih biljaka i prirod zrna F_1 generacije. (Heterosis in the roots of young maize plants and the yield of grain of the F_1 generation).

Arhiv Minist. Poljopr. 1937 : 4 : No. 6 : 3-19.

Previous conclusions and the results obtained in field experiments by workers in various countries on heterosis in maize are summarized and the author's successful attempt to evolve

a technique by which the phenomena of heterosis could be detected at a quite early stage in young plants by examining their root systems is described.

From material consisting of F_1 hybrids and their parents it was found by pot and field experiments that the type of root development and estimation of the total amount of root system of young maize plants may afford a relatively good basis for the identification (in the laboratory or greenhouse) of those F_1 generations which will give good grain yields. As compared with the parents, the group of F_1 plants that exhibited heterosis showed longer and more extensive root systems, a greater length of root with root hairs and also a higher yield of grain per plant. Data for groups of plants that, as regards the various aforementioned characteristics were intermediate, or equalled one or other of the parent forms, are also cited as part of the evidence upon which the author's conclusion was ultimately based.

377. ABBE, E. C. and PHINNEY, B. O. 633.15:575.172-181.13
The effect of the gene d_1 on the developmental pattern and cellular constitution of the stem in maize.

Amer. J. Bot. 1940 : 27 : No. 10 Suppl. : p. 1s. (Abst.)

Dwarf plants homozygous for d_1 have the same number of internodes as normal plants but the internodes are shorter. The "rib-meristem" which gives rise to internodal tissue undergoes fewer cell divisions than in normal plants and the parenchyma cells of the internode do not elongate as much as in normal plants.

378. BURNHAM, C. R. 633.15:576.356.2
Cytogenetic studies of an interchange between chromosomes 1 and 7 in maize.

Genetics 1941 : 26 : p. 143. (Abst.)

The naturally occurring semisterile-3 line of maize is heterozygous for an interchange between chromosomes 1 and 7. The positions of the breaks have now been determined.

379. FISCHER, H. E. 633.15:576.356.5:576.354.4:581.162.5
Causes of sterility in autotetraploid maize.

Genetics 1941 : 26 : p. 151. (Abst.)

Stocks of autotetraploid maize show varying degrees of reduced fertility. Cytological and genetical studies of such stocks have suggested that genetical factors were more important as causes of high sterility than were chromosomal irregularities in meiosis. Crosses between highly fertile and highly sterile stocks were studied and the results suggested that high fertility was dominant. Evidence was also obtained of the existence of cross-incompatibility between certain tetraploid stocks. Certain self-fertile stocks were cross-sterile when used as the female parent but were cross-fertile when used as the male parent; others were both self-sterile and cross-sterile when used as the female parent but were cross-fertile when used as a pollen parent.

380. EINSET, J. 633.15:576.356.5:581.163
Characteristics of parthenogenetic diploids derived from tetraploid maize.

Genetics 1941 : 26 : p. 150. (Abst.)

Diploids formed by parthenogenesis occur in stocks of autotetraploid maize. These derived diploids resemble ordinary diploid maize and provide valuable material for comparisons between diploid and autotetraploids. Diploids were found to flower several days earlier and to have smaller staminate inflorescences and kernels than tetraploids. Tetraploid plants, however, may be either shorter, of similar height or taller than diploid sibs.

381. SASS, J. E. and BRYAN, A. A. 633.15:581.45:581.2
Histology of a genetic malformation in corn.

Proc. Ia Acad. Sci. (1939) 1940 : 46 : p. 180. (Abst.)

In the malformation called "knotted leaf" there occur raised regions on the dorsal surface of the leaf, commonly on the veins, with corresponding depressions on the ventral surface. These emergences are thickened folds of the leaf blade, the thickening being mainly due to enlargement of mesophyll and epidermal cells, without increase in chromosome number.

382. STRINGFIELD, G. H.,
LEWIS, R. D. and
PFAFF, H. L. 633.15-1.557:575.12(77.1)
The Ohio cooperative corn performance tests.
Spec. Circ. Ohio Agric. Exp. Sta. 1940 : No. 59 : Pp. 27.

Details are given in 16 tables of maize yield trials carried out in 1939 in Ohio. Data from 49 tests are included and there were 20 entries (including both hybrids and open-pollinated varieties) in each test. In no test did an open-pollinated variety yield as well as the best hybrids. Many of the best hybrids were still in the experimental stage and not yet in commercial production. Percentages of broken stalks are given in the tables and definite strain differences in amount of breakage were found.

383. HEYNE, E. G. and
BRUNSON, A. M. 633.15-2.112-1.521.6:575.11
Genetic studies of heat and drought tolerance in maize.
J. Amer. Soc. Agron. 1940 : 32 : 803-14.

In the artificial test for heat and drought resistance used in these studies maize seedlings are exposed to a temperature of 127° to 130° F. and a relative humidity of 30% for 5 hours, with the soil kept moist. The amount of exposed tissue killed is determined after 3 days and account is also taken of the number of plants killed. This method has shown good agreement with results in the field.

Resistant inbred lines were crossed with susceptible lines carrying marker genes or translocations and segregating back-cross progenies were examined for association between resistance and the gene or translocation concerned. One of the resistant lines, K.10, consistently increased the resistance of the crosses in which it was involved.

The "sugary" gene *su* always decreased the resistance of plants carrying it relative to those carrying "starchy", *Su*, and this may be an important cause of the greater susceptibility of sweet corn.

The "glossy" genes *gl*₁ and *gl*₂ conferred increased resistance though they entered the crosses with the susceptible parents. This was not the case however with *gl*₃. The aleurone colour genes *Pr* and *C*, entering with the resistant parents, were associated with increased resistance. The above mentioned genes belong to the following linkage groups: *Su*-chromosome 4; *Pr*-chromosome 5; *Gl*₁-chromosome 7; *Gl*₂-chromosome 2; *C*-chromosome 9. The groups associated with chromosomes 3 and 8 were not tested and no association was found in the remaining groups (chromosomes 1, 6 and 10).

Hybrid vigour in itself does not confer heat resistance; resistance is intermediate or partially dominant in the *F*₁.

384. PAINTER, R. H. and
BRUNSON, A. M. 633.15-2.7-1.521.6:575
Differential injury within varieties, inbred lines, and hybrids of field corn caused by the corn earworm, *Heliothis armigera* (Hbn.).
J. Agric. Res. 1940 : 61 : 81-100.

This is an account of the work which has been done at the Kansas Agricultural Experiment Station since 1924 on the resistance of maize to earworm. The percentage of ears infested and the degree of damage to the ears were recorded at harvest. The plant material used was chiefly that grown in the breeding programmes and yield tests carried out at the station but there were a few special experiments. The hybrid and inbred material studied had thus not been selected consciously for resistance to earworm. Certain maize inbred lines were found to transmit a tendency towards resistance to their progeny while others transmitted a tendency towards susceptibility. Differences in resistance and susceptibility to injury of the developing bud of young maize plants are also inherited and such differences appear to be independent of the differences in resistance to ear damage. Length of husk extension and flowering date have some influence on the amount of damage to ears but many marked breaks in the correlations between these two characters and ear damage were found.

385. WALTER, E. V. and
BRUNSON, A. M. 633.15-2.7-1.521.6:575.1
Differential susceptibility of corn hybrids to *Aphis maidis*.
J. Econ. Ent. 1940 : 33 : 623-28.

Observations were made on the infestation by the aphid, *Aphis maidis*, of a large number of

inbred lines and hybrids of maize. Some inbred lines were extremely susceptible while others were practically immune. Some inbreds, e.g. R.4, appear to transmit their resistance to their hybrids while others, e.g. YS.79, do not. No plant character or group of characters was found to be consistently correlated with aphid susceptibility.

BARLEY 633.16

386. GÖPP, K. and SAUER, W. 633.16:575:581.6(43)
633.16.00.14(43)
Die deutschen Braugerstensorten. Zusammenfassende Bearbeitung mehrjähriger Untersuchungsergebnisse. (**The German varieties of malting barley. Summary of several years' experimental results.**)
Wschr. Brau. 1939 : 56 : 209-16, 219-23.

A survey is given dealing with the development and aims of plant breeding, the testing and official recognition of plant varieties in Germany and the mechanism adopted for the maintenance of purity of seed and the elimination of undesirable or synonymous varieties—all with special reference to barley. New types are of course being added from time to time.

A list (1938) of approved two-rowed spring barleys (*Hordeum distichum nutans*-a) is given. Regional requirements in regard to barleys are met by grouping them into universal and local varieties—the former having proved suitable for growing throughout Germany, the latter only in certain districts.

Single variety cultivation in a particular region is also adopted on occasion as a means of improving barley cultivation and output.

The method of registration and testing of varieties as regards yield, quality, etc., is described in detail and their performance in a series of different types of variety trials is set out.

Where malting barleys are concerned special determinations of malting quality are made in a final investigation.

The results of regional trials of spring barleys are recorded and discussed.

Selected particulars from the State Variety List are cited and illustrated as a basis for varietal descriptions after which some of the malting barleys grown in Germany are described with notes on their origin, distribution, yield and quality.

387. WOODWARD, R. W. and TINGEY, D. C. 633.16:581.46:575
Velvon, a new smooth-awned barley.
Bull. Agric. Exp. Sta. Utah 1940 : No. 293 : Pp. 11.

Velvon is a new barley variety with smooth awns, with relatively stiff straw and with a high degree of resistance to covered smut and is adapted for growing on the irrigated farms of Utah and adjoining states. It was selected from the cross Colorado selection 3063 (from a Coast x Lion cross) x Trebi (a leading commercial barley variety in Utah). Velvon, like most smooth-awned varieties of barley found in the Great Basin areas, has poorly feathered styles which reduce the fertility considerably in unfavourable seasons. Types with improved feathered styles are being developed from crosses involving Velvon.

MILLETS AND SORGHUM 633.17

388. JAKUŠEVSKII, E. S. 633.171:575(47)
(**New promising varieties of millet.**)
Soviet Plant Industry Record 1940 : No. 1 : p. 106.

Varieties characterized by high yield combined with earliness, drought resistance and rust resistance have been obtained.

RICE 633.18*

389. JODON, N. E. 633.18:575(76.3)
Progress in improving rice varieties.
Bienn. Rep. Rice Exp. Sta. Crowley, La 1937-38 : 15-17.

During the past 25 years of improvement work at the Rice Experiment Station, Crowley, Louisiana, several thousand varieties have been introduced and tested and a collection of 300 or more distinct varieties which grow fairly well under Louisiana conditions has been

* See also Abst. 313.

built up. In the course of this work the three varieties Rexoro, Nira and Fortuna were found. Rexoro and Nira were selected from Philippine material and Fortuna from Formosan. The major part of the work on developing new strains from crosses has been done with the progeny of 25 crosses made in California. About 14 of these crosses have given rise to strains worth further consideration and only two or three have given selections that might have a place commercially. Edith x Fortuna has produced some early, productive, non-shattering, excellent milling, long-grained types. Colusa x Blue Rose and Kameji x Blue Rose have given strains which mature earlier than or with Blue Rose and have a similar grain type; some selections from the former are excellent in yield and milling quality and less susceptible to certain diseases than Blue Rose. Disease-resistant strains have been obtained from Kameji x Blue Rose, with high yields and satisfactory milling quality but no better than Blue Rose in table quality.

Over 300 crosses have been made at the Rice Experiment Station since 1932 and selection is being carried on among the progeny of 50 or more. A promising early strain has been obtained from Iola x Blue Rose, though both parents are late; this strain is resistant to *Cercospora* and has satisfactory milling and fairly good cooking quality. Certain selections from Rexoro x Delitus have a better plant type than Delitus and may be more productive. Strains with excellent plant types and fine, large, long grains have been selected from Rexoro x Fortuna. Rexoro x Blue Rose crosses are being back-crossed to obtain non-shattering, fairly disease-resistant strains of excellent grain types.

Milling quality and table quality are difficult to combine and it seems likely that the characteristics such as vitreousness which make the grain resistant to breakage in milling also make it less desirable when cooked.

The article concludes with a very brief outline of the breeding routine.

390. NOGUCHI, Y. 633.18:575.12:578.08
(A new technique on cross-breeding of rice).
 Bot. and Zool. 1937 : 5 : 140-41.

In the new technique, which was tested with 8 varieties of lowland rice, stems bearing panicles were severed low down just before flowering and placed in a flask of distilled water. The next day cross-pollination was carried out. Numbers of seeds were obtained. Their average weight was 10.7 mg., which is much lighter than the average weight for the variety Sen-ichi grown normally, which is 24.2 mg. The seed germination, however, from the crosses Yagashira No. 43 x Yatsuzeki, Sen-ichi x Yatsuzeki, and Shinshu x Yatsuzeki proved as good as that from normal seeds.

As a rule the amount of seed set from crossing in the field is less than 10% owing to unfavourable conditions during flowering and the writer suggests that post-harvest pollination as above described might be a useful way of increasing seed production.

391. KONDO, M. and KASAHARA, Y. 633.18:578.088(52)
(On the discrimination of rice varieties by means of colouring reaction of hulled kernels to phenol-fuchsine).
 Proc. Crop Sci. Soc. Japan 1940 : 12 : 122-28.

Experiments made with 269 varieties of rice in 1939 and 118 in 1940 showed that varieties may be distinguished by differences in the colour reaction of their unpolished grains to a mixture of phenol, fuchsine, alcohol and water. Incidentally it was noted that within the same variety, the older the rice, the redder the coloration. This method applied to rice is new to Japan.

392. ISHIKAWA, J. 633.18:581.162.5:575.113.7
(Studies on partially sterile rice plant).
 Proc. Crop. Sci. Soc. Japan 1940 : 12 : 25-30.

A partially sterile rice plant segregated into fertile and partially sterile plants in the ratio 7 : 1. In the subsequent generations the fertile plants produced only fertiles and the sterile ones segregated as before and in the same ratio.

The partially sterile grains have a lower specific gravity and a higher 100 grain weight (as measured by the weight of 100 unhulled grains in grammes) than the fertile grains.

The results of seed disinfection and ultra-violet and X-ray irradiation upon the germination of the partially sterile and the fertile types are also recorded.

It is suggested that the partial sterility may be due to lethals which when homozygous cause the death of the plant and when heterozygous result in reduced viability. The inheritance of such genes must be extremely complex.

393. RYKER, T. C. and JODON, N. E. 633.18-2.484-1.521.6:575.11
Inheritance of resistance to *Cercospora oryzae* in rice.
 Phytopathology 1940 : 30 : 1041-47.

Field observations, supported by artificial inoculation studies, have shown that rice varieties can be classified as highly susceptible, intermediate and highly resistant in their reaction to *C. oryzae*. The F_2 segregations in six crosses of resistant x susceptible varieties showed that resistance was due to a single dominant factor in each case.

FORAGE GRASSES 633.2

394. BRITTINGHAM, W. H. 633.21:575.127.2:576.356.5
An artificially produced hybrid between *Poa compressa* L. and *P. pratensis* L.
 Genetics 1941 : 26 : 141-42. (Abst.).

A hybrid plant ($2n = 72$) was obtained from the cross Canada Bluegrass female (*P. compressa* L., $2n = 42$) x Kentucky Bluegrass (*P. pratensis* L., $2n = 56$). The hybrid had thus resulted from the union of an unreduced egg cell of *compressa* and an approximately reduced pollen grain of *pratensis*. The hybrid is fairly fertile, produces seed about 45% heavier than seed of either parent and is intermediate between the two parents in other characters.

395. MYERS, W. M. and HILL, H. D. 633.22:576.356.5:576.354.4
Variations in meiotic behavior among plants of the autotetraploid *Dactylis glomerata*.
 Genetics 1941 : 26 : p. 162. (Abst.).

Meiosis was studied in 20 tetraploid *D. glomerata* plants ($2n = 28$). Quadrivalent and univalent frequencies, the number of first anaphases with lagging nuclei and the percentages of tetrads with micronuclei are given. The results suggest that anaphase I laggards are of major importance and unequal disjunction of quadrivalents of minor importance in producing aneuploid gametes.

LEGUMINOUS FORAGE PLANTS 633.3

396. WIPF, L. and COOPER, D. C. 633.3:576.356.5:632.3
 635.65:576.356.5:632.3
Somatic doubling of chromosomes and nodular infection in certain *Leguminosae*.
 Amer. J. Bot. 1940 : 27 : 821-24.

Tetraploid cells are already present before infection by nodule-producing bacteria and their presence appears to be a necessary condition for the development of a nodule (cf. also "Plant Breeding Abstracts", Vol. X, Absts 155 and 466).

397. BRINK, R. A. and COOPER, D. C. 633.31:581.141:581.162:575.125
Double fertilization and development of the seed in Angiosperms.
 Bot. Gaz. 1940 : 102 : 1-25.

The growth of embryo and endosperm was studied in lucerne during the first 144 hours after pollination. Fruits obtained by self-pollination were compared with those produced after cross-pollination. 34% of the fertilized ovules were found to collapse after self-pollination as compared with only 7% after cross-pollination. The collapse of fertilized ovules was associated with an excessive growth of the inner integument. The number of endosperm nuclei increases exponentially but the number of embryo nuclei only arithmetically. There is very little difference between the growth rate of embryos from cross- and self-pollinations but the growth rate of the endosperm after cross-pollination is significantly greater than that after self-pollination. Also at a given stage of development, a hybrid embryo is accompanied by a more advanced endosperm than is an inbred one. The endosperm thus shows hybrid

vigour. The quicker growth of hybrid endosperms also probably explains the lower percentage of seeds collapsing in cross-pollination; in cross-pollinated fruits the endosperm is able to keep pace with the growth of the tissues surrounding the embryo. A review of food storage in the ovules of Angiosperms is given and it is pointed out that the endosperm is probably important in transferring food to the young embryo.

398.

NIJDAM, F. E.

633.321:575.11.061.6:581.48

633.321:575.116.1.061.6

The heredity of a brownish-black spot on the seedcoat of *Trifolium pratense* L. caused by melanine.

Genetica 1940 : 22 : 123-30.

Data are recorded to show the inheritance of the melanine produced coloration on the seeds of red clover (*Trifolium pratense*).

The formation of melanine is due to a recessive factor *a* which is easily distinguished when crosses are made with white-flowering plants *gg*. Crosses were made of the type *gg aa ee* x *Gg Aa Ee* in which *Gg* represents the plants with coloured flowers and the factor *e* which produces a blue flower colour, causes a blue tint among half of the coloured flowering plants and a purple-red tint *Ee* among the other half.

The results showed that there was no linkage between *g* and *a*, but the possibility of a linkage between *a* and *e* is to a great extent confirmed by crosses between *Gg BB Ee* x *Gg bb ee* (the factors *bb* producing in the presence of *E* a pink flower colour and with *ee* a dull bluish pink tint) and by further crosses of the white flowered plants with blue flowered ones. R. M. I.

399.

LEVAN, A.

633.321:576.356.5:581.04

Framställning av tetraploid rödklöver. (Production of tetraploid red clover).

Sverig. Utsädesfören. Tidskr. 1940 : 50 : 115-24.

A report on the production of tetraploid red clover plants by the application of colchicine by two methods: (1) seed treatment and (2) painting of growing points with colchicine agar. About 400 plants more or less markedly affected by the treatment were obtained.

The various external and cytological effects of colchicine upon the plants are discussed. Many of the plants appeared to be chimaeras composed of tetra-, octo- and possibly even 16-ploid tissues. Few tetraploid types appeared to consist wholly of tetraploid tissue and in the endeavour to obtain some purely tetraploid forms about 500 cuttings, some consisting solely of a stem bud, were taken by Nilsson and Anderson's method from 67 plants which seemed likely from their cell size to have tetraploid tissue. A few tetraploids were thus obtained and from them 69 tetraploid progeny of the Merkur and Wambasa strains and hybrids between them were raised.

Though in some respects the tetraploids had larger and coarser leaves than the diploid plants and were in general of the gigas type, not all the plants had coarsely pubescent petioles; vitality was very good; pollen fertility was about 77% as compared with 93% for the controls. The set of seed from the crosses made up to the present between tetraploids was good and the germination percentage was 95%.

The chromosome morphology and irregularities in behaviour, which are briefly referred to here, are to be discussed in another paper.

Judging from their vitality tetraploid forms may prove of practical value, though no definite decision on this point can be reached at the present stage. The tendency to sterility is doubtless partially genetically conditioned; it may well be possible to overcome this defect by selection.

400.

ATWOOD, S. S. and

HILL, H. D.

633.322:576.354.4

The regularity of meiosis in microsporocytes of *Trifolium repens*.

Amer. J. Bot. 1940 : 27 : 730-35.

At first metaphase of meiosis only one cell out of 605 examined clearly showed $15_{II} + 2_I$; the rest mostly showed 16_{II} but a few cases interpreted as precocious disjunction were noted. The average chiasma frequency per cell was 16.7. Occasional lagging bivalents were noted at first anaphase. In 906 groups at first anaphase or second metaphase 16 chromosomes were found. One case of a 15-17 distribution was observed and two others had each a single group

of 32 chromosomes. All the second anaphase groups studied had 16 chromosomes and the root tips of over 100 plants all had 32.

From the regularity of meiosis it is suggested that white clover is an amphidiploid.

401. ATWOOD, S. S. 633.322:581.162.5:575.113
Cytogenetic basis of self-compatibility in *Trifolium repens*.
 Genetics 1941 : 26 : p. 137. (Abst.).

A single self-compatible plant was found when 615 plants were self-pollinated under bags. Clones from this one plant were also self-compatible. The self-compatible plant was crossed with a self-incompatible one and a number of the F_1 hybrids were intercrossed and back-crossed to both parents. The results suggested that the original self-compatible parent was heterozygous for self-compatibility.

402. COUTINHO, A. 633.35:576.312.34
 - Tipos cariológicos nas *Vicias*. (Karyological types in *Vicia*).
 Palestras Agronómicas, Lisboa 1939 : 2 : 81-95.

Descriptions are given of the chromosome morphology of *V. onobrichyoides*, *V. spuria*, *V. lutea* and a number of other species. Instances where chromosomes or chromosome parts have been identified as the carriers of definite genes are cited—e.g. in trisomics, and the cultural value of many polyploids is discussed.

ROOTS AND TUBERS 633.4

403. MAGRUDER, R. *et al.* 633.41-1.524(73)
Descriptions of types of principal American varieties of red garden beets.
 Misc. Publ. U.S. Dep. Agric. 1940 : No. 374 : Pp. 60.

Eight principal American varieties of red garden beets Flat Egyptian, Crosby Egyptian, Light Red Crosby, Early Wonder, Detroit Dark Red, Morse Detroit, Ohio Canner and Long Dark Blood are described in this publication. In the description of each variety details are given of its adaptability and use, season, morphology of the plant (leaves, neck, and root), synonyms and history. The text is illustrated with 30 full page plates. Before the descriptions of the eight varieties, there is an introductory section dealing mainly with the influence of environment on plant and varietal characters.

404. PANČENKO, Ja. I. 633.426:575.42:581.43
(Upbringing and selection in breeding forms of root crops).
 Jarovizacija 1940 : No. 2 (29) : 105-08.

By selection in the Vyšegorodskaja swede, which is very productive but irregular in form, it has been possible to produce a form with regular round roots with much less pronounced neck, which has given record high yields. Great attention was given to the condition of the soil during the period of selection, as the variety was found to be very susceptible to this factor.

405. TAMARGO, M. A. 633.491:575:551.566.1
A study of seedlings and varieties of the Irish potato in Cuba.
 Amer. Potato J. 1940 : 17 : 323-27.

An account is given of the yield, mosaic infection and blight resistance of a number of potato varieties and seedlings when introduced into Cuba. A marked loss of vigour and reduction in yield was found; part of this loss is due to virus diseases but it is suggested that the length of day is also directly responsible for much of it since wild varieties from short-day areas of South America did not lose any vigour at all. The value of South American wild potatoes for breeding projects in Cuba and other tropical countries is very great and there are in such places no difficulties caused by the wild forms being adapted to a 9-10 hour day and not to the 13 hour day to which European varieties must be adapted.

406. RAZUMOV, V. I. 633.491:575.257
(Vegetative hybrids).
 Soviet Plant Industry Record 1940 : No. 1 : p. 104.

Experiments are reported in which the progeny of *Solanum-Datura* grafts were distinguished by longer dormancy and greater resistance to degeneration than the controls; in which the changes induced in *S. Antipoviczii* by grafting are transmitted to the second clonal generation,

and in which seedlings from the first generation of tubers obtained after grafting retain the same modifications as those induced by the grafting.

407. VESELOVSKY, I. A. 633.491:581.6:578.08
Biochemical and anatomical properties of starch of different varieties of potatoes and their importance for industrial purposes.
 Amer. Potato J. 1940 : 17 : 330-39.

The size of starch grains, their ash and phosphate percentages, the relative viscosity of starch solutions, the percentage of starch hydrolysed in a given time, the stretching capacity and strength of fabric impregnated with starch pastes and the paste percentage and stiffness of calico samples which had been dried and ironed after impregnation with starch pastes have all been investigated. The starches investigated were obtained from a large number of *S. tuberosum* varieties and variety hybrids, from South American potatoes such as *S. andigenum* and *S. Rybinii* and also from hybrids between *tuberosum* and *andigenum*. The highest viscosity of starch solutions was obtained in *S. andigenum* and its hybrids and the lowest in *S. Rybinii* and in cultivated varieties such as "Grenzmark". It is shown that for different technological processes different types of starch are required, for example pastes of a low viscosity and high penetration power are required for warp sizing in the textile industry while a more viscous starch is required for the finishing process, and it is suggested that for these different processes only starches from definite varieties should be used.

408. REDDICK, D. 633.491-2.411.4-1.521.6:575
 632.411.4:576.16
Problems in breeding for disease resistance.
 Chronica Botanica 1940 : 6 : 73-77.

In this article the author considers the problems encountered in attempts to breed a potato immune to *Phytophthora infestans*. It is pointed out that *P. infestans* is not found on potatoes in S. America and that one does not therefore expect to find resistant varieties there. *P. infestans* is found in Mexico and it is in Mexico also that resistant and immune potatoes such as *Solanum demissum* are found. *S. demissum* forms very small tubers and has stolons as much as 2 meters long. The F_1 between *S. demissum* and domestics is very similar to *S. demissum* but by repeated back-crossing it is possible to obtain hybrids which are resistant and which have many domestic characteristics. Selfing of the hybrids should be avoided. Most of the back-crossing has to be effected using domestics as male parents, as seeds are not obtained when the hybrids are used as male parents. It is pointed out that Katahdin marks the beginning of a new era in potato breeding as this variety has most of the desired characters which go to make up a commercial success and is also highly fertile.

In the second part of the article it is pointed out that *P. infestans* is moderately "plastic". In N. America this fungus never forms oospores and the parasite persists from year to year entirely in the vegetative condition. There is, however, a variation in the ability of the asexual swarm spores to produce infection when more than average opposition exists in the host and it is possible to step up the virulence of *P. infestans* by passage through a resistant host. The new and higher level of virulence is not lost when the organism is cultured on a very susceptible variety. Details are given of experiments showing that supposed immune hybrids can be infected by strains of the fungus whose virulence has been stepped up. It is also pointed out that commercial potato varieties are heterozygous for many characters and probably show hybrid vigour. New varieties must also be either virus resistant or virus tolerant. Most American commercial varieties are tolerant of the X virus ("healthy potato virus") but in their seed offspring all gradations of resistance from complete susceptibility to tolerance are found. In spite of all these difficulties blight resistant hybrids of commercial standards have now been obtained.

409. TROUVELOT, B. 633.491-2.7-1.521.6:575.127.2
 Etat actuel des recherches sur les solanées tubérifères résistantes au doryphore. (**Present state of the researches on tuberous Solanums resistant to the Colorado beetle**).
 Rev. Zool. Agric. 1938 : 37 : 177-80.

Solanum demissum has such a high degree of resistance to the Colorado beetle that the insect cannot establish itself. F_1 hybrids of *S. demissum* x *S. tuberosum* inherit the resistance of *S. demissum* in varying degree, sometimes being practically as resistant as the *demissum*

parent, but are not very productive of tubers. In back-crosses to *S. tuberosum* the resistance is usually very much diminished, but by raising large numbers of plants there appears to be a possibility of combining a commercially useful amount of resistance with a good yield of tubers.

This method of controlling the Colorado beetle is a useful complement to the method of multiplying the natural enemies, since it does not involve the use of chemicals.

410. 633.491-2.8-1.521.6:575

New potato needed in Maine.

Market Gr. J. 1940 : 67 : p. 495.

According to this brief note, E. S. Schultz, C. F. Clark and F. J. Stevenson, by crossing plants resistant to each of the potato viruses X and A have obtained progeny resistant to both. These two viruses together produced wild mosaic disease, occurring widely on Green Mountain, Triumph and Rural New Yorker, varieties which normally carry virus X.

411. 633.492:581.145

Inducing the flowering and the fruiting of sweet potato by water culture.

Jap. J. Bot. 1940 : 10 : 335-42.

The sweet potato does not normally flower in the temperate parts of Japan, but 3 out of 5 varieties have been induced to flower by growing them in water culture. Successful pollinations have been made with these varieties.

FIBRES 633.5*

412. 633.51:575(52)

(Breeding report of the cotton plant, "Ryo-yo No. 1". Appendix 1. Spinning test report on Manchurian cottons. Appendix 2. Preliminary report on the hybrid strains of Manchurian cotton).

Res. Bull. S. Manchuria Rly Co. 1937 : No. 19 : Pp. 11.

The variety Ryo-yo No. 1 has been obtained by pure line selection of the variety Teikaton Hakushu Teikaton White which is an early maturing form of cotton with a fine long staple. The new variety, which is a short plant with many fruits, grows quickly; and its fibres are fine and long, pure white and lustrous. It is highly resistant to disease during the seedling period. Its two year average for ginned cotton was 258.2 with a ginning outturn of 25.7%, as compared with 157.7 and 22.4% respectively for Teikaton White.

As spinning material Ryo-yo No. 1 showed a count of 30-32 and it is regarded as being even slightly finer than Kings 113.

413. 633.51:575(52)

(Breeding report of the cotton plant "Ryo-yo No. 2").

Res. Bull. Agric. Exp. Sta. Kung-Chu-Ling, Manchoukuo 1939 : No. 28 : Pp. 11.

With the object of obtaining a new variety combining rapid growth with heavy pods and high ginning outturn promising crosses were begun in 1929 between Teikaton White from Manchuria and Million Dollar from Southern China and in 1938 the strain V.27-6-8-20 was selected as a new variety and named Ryo-yo No. 2. It is as early in maturing as Ryo-yo No. 1 and earlier than the early Upland type Kanno No. 1 by one week in flowering and by 25 days in ripening of the bolls. Over 80% of the seed cotton can be picked by September. On a two year average the yield of seed cotton from Ryo-yo No. 2 was 1588.6 kg., of ginned cotton 433.7 kg. and the ginning outturn 27.4%, the corresponding figures for Ryo-yo No. 1 being 1240, 308.2 and 24.8 and for Kanno No. 1, 1396.1, 443.9 and 31.2.

The fibres of the new variety, which are white, lustrous and soft, are still finer than those of the parent form or Kings 113, the most frequent counts being 30-36.

414. 633.51:575.12:575.148

(Germination of cotton pollen in intravarietal crosses).

Jaroviczacija 1940 : No. 1 (28) : 18-22.

Experiments are reported in which a higher pollen germination and higher seed set were

* See also Absts 313 and 314 (Cotton); Abst. 315 (Kapok).

obtained by pollinating emasculated flowers with a mixture of pollen from different plants of the same variety; pollen from plants growing on fertile ground was more effective. The pollen germinated more rapidly and the pollen tubes were thicker and grew faster when using pollen from other plants. In consequence of this the percentage of sterile ovules was lower.

415. TANAKA, M. 633.51:575.127.2:578.08
(A new method of successful crossing in cotton).
 Bot. and Zool. 1937 : 5 : 142-43.

Reciprocal crosses were made between an Asiatic and an Upland variety of cotton and three lots of plants were raised: (1) a group in which the bases of the stems bearing the pollinated flowers were tightly bound with wire; (2) a group in which the stems were peeled round the base (instead of being ligatured), while at the same time the flower-buds, pods and buds at the top of the stems were removed; (3) a control group. The percentages of maturing bolls from the Asiatic x Upland cross were 34.54 and 46.15 for groups (1) and (2) respectively as compared with 22.59 in the control group; while for the reciprocal the corresponding figures were 3.70, 15.00 and 2.13. The improvement is attributed to the greater amount of nutritive substances available for the growing seed as a result of the treatment.

416. NAKATOMI, S. 633.51:576.356.5:581.04
(Induced polyploidy in Asiatic varieties of cotton plant by colchicine treatment).
 Proc. Crop Sci. Soc. Japan 1940 : 12 : 16-20.

A detailed account of experiments on colchicine treatment of seeds and seedlings of Asiatic and Upland varieties of cotton to produce polyploids. The cytological behaviour of one polyploid plant ($n = 26$) is described. The fibre produced by the polyploid type is longer and thicker than normal and the weight of the seeds is also greater. The next generation is being studied.

417. KRASOVSKII, I. R. 633.51-1.557:575.3
(Upbringing of élites of cotton and inheritance of yield of lint).
 Jarovizacija 1940 : No. 2 (29) : 85-89.

Data are presented to show that the quality of the plants produced from any seed is influenced by the conditions of growth of the plants producing that seed.

418. MILKOVSKI, Ior. D. 633.52:575(49.7)
(The new selected varieties of cotton at the Čirpan Experiment Station).

Rev. Inst. Rech. Agron. Bulg. 1938 : 8 : No. 2 : 87-116.

Before selecting initial material for breeding experiments at the Čirpan Experiment Station, a study of the local types of cottons was made and their classification and history are discussed in detail.

The breeding material for the experiment was obtained by repeated line selection combined with induced self-pollination by isolation of the flowers. Under the conditions at the Čirpan Station cross-pollination in the various years ranged from 2-10%. The methods which are used in selection, in subsequent comparative trials and in the general system of cultivation and the collection of data, are described in detail and should, at the end of the sixth year, produce adequate seed for distribution to producers. The technique of bagging was specially studied. Five selected lines Nos. 38, 52, 78, 81 and 100 underwent variety trials and all except the last surpassed the local population in earliness and under local conditions a crop over 80% of good quality cotton could in all probability be obtained from them before the early frosts set in. As regards yield, the average increase as compared with the local populations was 7.50-16.90%, No. 100 ranking first with 16.90% and No. 38 second with 11.70%.

All five selections were also superior in the percentage of lint produced, the average increase ranging from 1.20 to 3.40%. Here again No. 100 came first with 33.20%, and No. 38 second with 32.85%. No. 81, however, was inferior in this respect to the local type.

Determinations of the lint quality based on length, softness, strength, tensile strength, etc. carried out by two methods, further demonstrated the merits of the new varieties, of which short descriptions of the origin and botanical and economic features are appended.

419.

RAY, C.

633.52:576.312.35

633.854.54:576.312.35

Chromosome studies in the genus *Linum*.

Amer. J. Bot. 1940 : 27 : No. 10 Suppl. : p. 8s. (Abst.).

In 28 species of *Linum* the diploid numbers 16, 18, 20, 24, 28 and 30 were found. In 18 varieties of *L. usitatissimum* $n = 15$ and $2n = 30$ were found.

420.

SIZOV, I.

633.52:581.6:578.08

(Determination of the yield and quality of fibre on small samples).

Soviet Plant Industry Record 1940 : No. 1 : 106-07.

A method for determining fibre yield and quality on 40 grm. of straw has been devised. It is suitable for flax and hemp.

421.

KIHARA, Y.,

NAKAHARA, H. and

KODERA, G.

633.522:577.8:581.6:581.192

[Studies of fiber from *Cannabis sativa* (I). Relation of constituents of fiber to the growth periods and sex. On the value of the fiber from wooden parts of hemp as pulp].

Bull. Agric. Chem. Soc. Japan 1940 : 16 : 731-38.

Staminate plants show a higher proportion of alcohol-benzene extract, crude protein, total soluble sugar and pentosan than pistillate plants, but the total cellulose as well as α cellulose is higher in the latter than in the former.

422.

EL'KIN, S.

633.522-1.524:575

(Use wild hemp as breeding material).

Len i Konoplja (Flax and Hemp) 1940 : No. 9 : p. 28.

Wild hemp, which grows abundantly in the Altai and neighbouring regions, gives large yields of seeds and is extremely early in maturity, for which reasons it might be useful for use in crossing with cultivated forms.

423.

BOLHUIS, G. G.

633.524.3:581.162:631.531.12

Bloeibaarnemingen bij *Hibiscus Sabdariffa* L. en *Hibiscus cannabinus* L.**(Some observations on flowering with *H. Sabdariffa* L. and *H. cannabinus* L.)**

Landbouw 1940 : 16 : 404-12.

This paper records experiments on the practical aspects of date of sowing, seasonal flowering and length of vegetative period in relation to seed raising in *H. Sabdariffa* and *H. cannabinus* at Buitenzorg. Further experimentation is contemplated.

The possibility of utilizing vernalization or the regulation of illumination as a means of influencing growth is mentioned.

SUGAR PLANTS 633.6*

424.

YAMASAKI, M.

633.61:575(52)

(Sugar cane varieties in Formosa).

Proc. Crop Sci. Soc. Japan 1940 : 12 : 94-97.

In this note on leading varieties of sugar cane in Formosa at the present time F.108 (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1527) is recorded as having the highest sugar content. The tendency is to cultivate more varieties and varieties for special purposes. Drought or wind resistant canes are suggested for the dry or coastal regions respectively. A new wind resistant variety F.113 is gradually gaining recognition.

425.

633.61:575(96.9)

633.61:576.312.35

633.61:576.356.5:581.04

Report of Committee in Charge of the Experiment Station.

Hawaiian Sugar Planters' Association for the year ending September 30, 1939 : Pp. 121.

In the section on cytological work D. M. Weller reports that plants of *S. robustum* from New Guinea and New Britain have been found with chromosome numbers $n = 30$, $n = 48$ and

* See also Abst. 314 (Sugar Cane) ; Abst. 327 (Sugar beet).

$n = 72$, the numbers previously known being $n = 40$ and 42 . It therefore appears that recent importations of *S. robustum* have added new types to the collection. Buds of cuttings of sterile varieties such as P.O.J.36 and P.O.J.2714 and of sorghum hybrids have been treated with colchicine; treated buds produced taller, more robust and more numerous stalks than untreated. The flowers are to be examined for fertility when they appear. More than 10,000 seedlings from colchicine-treated seed of over 50 crosses have been planted in the field and will be examined for pollen grain size when they flower. The typical effect of colchicine on the shape of the coleoptile was observed and microscopic observations on the growing points of the treated seedlings showed that increases in chromosome number had occurred. In some experiments there was an increase in germination and a stimulation of seedling growth.

The work of the genetics department is reported by A. J. Mangelsdorf and C. G. Lennox. Among the 1622 crosses made were 260 between New Britain or New Guinea canes and local varieties. The station varieties 31-2806, 32-1063 and 32-8560 were also used extensively for crossing.

In addition to 98,000 seedlings space-planted at different stations, large numbers of remnant seedlings were transplanted in bunches of 20, the bunches being spaced an inch or two apart in the line. Previous work with this method, which was first tried on a large scale in 1937, suggests that useful seedlings can be selected from the survivors and its value is to be more carefully studied.

The results are summarized of variety trials involving the following canes:—28-4291 (Hawaiian Uba x H.456), 31-2484 (P.O.J.2878 x Uba-H.456), 31-2510 (P.O.J.2878 x 27-3755), 31-2806 (P.O.J.2878 x H.9811), 32-1063 (28-4898 x 26 C.270) and 32-8560 (Co.213 x P.O.J.2878).

The drought resistance of new seedlings is being tested. The following are outstanding in drought resistance: 28-2014, 31-701, 31-1926, 31-2340, 32-5417, 32-6697, 35-876, while P.O.J.2878 is described as average and H.109 appears among seedlings "definitely below average".

The possibility of determining the resistance of seedlings to eye spot in the transplanting flats is being studied.

No further importations of breeding canes are contemplated at present.

426. PAVLOV, K. 633.62-1.524(49.7)
(Sweet sorghum as a sugar bearing plant and the prospects of growing it in Bulgaria).

Rev. Inst. Rech. Agron. Bulg. 1938 : 8 : No. 2 : 3-40.

This well documented paper, which also contains references to some original work, deals with the following aspects of its subject :—

The economic background of the use and cultivation of sweet sorghum in Bulgaria, the terminology, origin, history and distribution of the plant and its requirements as regards soil and climate; its morphology, biology of flowering and systematic classification with descriptions of varieties grown in Bulgaria; the sugar content of the plant and its variation at different stages of development; cultivation and the various effects of removing the panicle upon the total sugar content in the stem and upon the ratio of saccharose to glucose—the role of varietal differences and of the stage when the panicle is cut is to form the subject of future study; and finally the determination of the best time for harvesting and records of yield trials with varieties grown in Bulgaria.

The research in progress includes the investigation of methods of processing the sugar and the composition and quality of the manufactured products, as well as the possibility of growing the plant as a forage crop.

427. BOCKSTAHLER, H. W. and SEAMANS, R. F. 633.63:575:578.08
Threshing and cleaning equipment for sugar beet seed.
 J. Amer. Soc. Agron. 1940 : 32 : 794-802.

Machines for handling sugar beet seed in the quantities obtained in breeding work and on small increase plots are described.

A combination thresher and draper threshes and cleans quantities from less than an ounce up to several pounds. The drum of the thresher is made up from several, slightly oblique,

coarse-toothed cross-cut circular saws stamped out of 10-gauge black iron, the concave being a curved plate with two $\frac{1}{8}$ " metal rods welded on it. The coarse stems are removed from the threshed material by a coarse-mesh shaking screen which passes small stems and seed on to an endless canvas belt passing over octagonal rollers. The seeds bounce and roll down this sloping canvas draper while the rubbish is carried up to the top.

A suction seed separator separates light seed balls from heavy by means of an up-draught which carries over the light but not the heavy seeds. This machine will handle separate lots or work continuously as desired.

A sugar beet seed polisher removes excess corky tissue from the seed balls and crushes light, empty seed balls. The seed is introduced through a hopper to the bottom of a sloping cylinder, up which it is propelled by a helicoid feed mechanism. The upper part of the cylinder contains a rotating axis studded with steel pegs and so the seed balls are ground against each other as they pass up the cylinder.

For use in the field a portable machine combining a thresher, suction seed separator and winnower has been built. This machine handles easily an acre per day.

428. OWEN, F. V.,
CARSNER, E. and
STOUT, M.

633.63:581.143.26:575.11

Photothermal induction of flowering in sugar beets.

J. Agric. Res. 1940 : 61 : 101-24.

The bolting of biennial sugar beets was found to be dependent upon both a cold period during their growth and upon the length of day. All varieties of *Beta vulgaris* behaved as long-day plants but the annual varieties differ from the biennials in being able to bolt without having experienced a cold period. High temperatures in later stages were sometimes found to cancel the effects of an earlier cold period. It was also found that vernalization by low temperature treatment of germinating seed increased the rate of bolting in the easy-bolting biennial strains but had no effect on two varieties of low-bolting tendencies.

A new factor B' , which is linked with the gene R for red hypocotyl, was found to be responsible for an easy-bolting tendency. Back-cross and F_2 segregations were studied in crosses between Clone 70 (rrB^1b), Clone 79 ($RRbb$) which is male sterile and Clone 90 ($rrbb$) which has strong self-sterility. Clones with strong self-sterility and male sterility were used to make crossing easy. The progenies were tested for bolting by subjecting some of the seed to vernalization treatment and growing the plants in the greenhouse. Non-vernalized seed and the Munerati annual strain were also grown for comparison. The results showed that plants with the factor B' will flower as readily as the Munerati annual when grown under long days and at warm temperature only if they have been previously vernalized. The factor B' thus differs from the annual factor B described by Munerati and Abegg (see "Plant Breeding Abstracts", Vol. II, Abst. 256 and Vol. VII, Abst. 1018). The cross-over value of B' and R was found to be 17.6. This is very close to that found for B , and R and B' and B may therefore be allelo-morphic.

STIMULANTS 633.7*

429. MIDDELBURG, H. A.

633.71:575(92.2)

Proefstation voor Vorstenlandsche Tabak. Jaarverslag 1938-1939.
(Experiment Station for Vorstenland Tobacco. Annual report 1938-1939).

Meded. Proefst. Vorstenl. Tab. Klaten (Java) 1940 : No. 88 : Pp. 43.

Work with crosses to obtain tobaccos combining the Vorstenland quality with resistance to seed-bed disease, mosaic and slime disease is still in progress.

The F_1 crosses between Timor-Methook and Timor-Djombor types show particularly high resistance to seed-bed disease.

Among the new Timor Vorstenland hybrids (all F_1 s), the Timor Methook crosses seem somewhat more resistant than those with Timor-Djombor, though the latter were in general of finer quality, the best strain being E3K 18-19 x Timor-Djombor F_1 . The Timor-Methook x KBS F_1 was characterized by well-developed plants, and the Timor-Djombor x Chlorina F_1 by remarkable brightness.

* See also Abst. 315 (Tea, Coffee and Cacao).

In 1938 an F_4 was obtained from the mosaic resistant Ambalema x KW.10 hybrid. At the same time the cross with Timor-Djombor was inspected and found little better in quality than the KW.10 crosses which otherwise attracted favourable attention. Though the appearance of good quality at this stage is hopeful, yet Plot 25 (F_4) which showed the greatest resistance was worst in quality and the fact that Plot 22 (F_2) was ranked highest shows that selection is still in the early stages. Seed was obtained from infected plants of good quality, as the chances of combining resistance and quality in the progeny are good in view of the small number and recessive nature of the genes conditioning mosaic resistance.

In connexion with work on resistance to slime disease in 1938 the F_2 from some crosses of resistant Deli lines *inter se* and with Timor-Djombor and KW.10 were judged. The quality in general was medium though already a few strains with good characteristics were obtainable. In the preliminary sowings all the crosses were once again combined with Timor-Djombor.

The following report is made on work on the combination of qualities from various types: — Deli-Vorstenland D2K has not fulfilled its former promise (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1137) and as the Deli-Vorstenland strains are highly sensitive to various external factors, for the time being further selection will be stopped, though under favourable conditions the type can produce tobacco of superior quality.

The F_5 from the cross X x KBS (made with the object of increasing the dryness of KBS which burns so well) received a favourable report, though it is doubtful if the above object was actually achieved.

At Methook an F_4 of pretty good quality was obtained from Kedoe x KW.10; but the Kedoe already twice back-crossed to KW.10 got a better report and is already superior in development. Comparisons with other varieties have still proved very unfavourable to the Kedoe hybrids.

From KR. (i.e. X-ray) mutants some good combinations were obtained, among others, KR.9 x Chlorina-b, which was intended to combine the numerous leaves and their dense arrangement found in KR.9 with the qualitative characteristics of Chlorina. The F_3 already showed great uniformity with good quality. Development was, however, not entirely satisfactory. In this respect the F_3 of KR.6 x Chlorina-b was superior with nice light shades combined with good quality.

Various KR. mutants were crossed with Timor Dj.

The crosses between Y.10-788 and KW.10 have shown no advance in quality in the F_5 , though the F_4 control at Djombor was given a better placing. The result was, on the whole, poor both for parents and the cross.

Selection of the old Kanari-Wedi and KW.10 and Y.10-788 material gave no results.

The KR.4 X-ray mutant was again selected for early and late varieties, but no such qualitative differences were found.

No reliable differences could be discovered between the F_4 , F_5 and F_6 Chlorina-b lots. The F_6 did well both in the selection plots and the variety tests.

New experiments showed that pollination with X-rayed pollen produced many mutant progeny and this method has practical advantages as compared with irradiation of flower buds.

Experiments planned to obtain haploids by irradiation with heavier doses than about 400 and 500 r. could not be carried out with the apparatus available.

In variety tests of quality, M3A was the only old variety to maintain its place in competition with the good new varieties.

The X-ray mutants KR.2 and KR.4 and the strains KK.63 and E. x KBS. showed no outstanding qualities, though KBS. is worth retaining for hybridization purposes.

The best all-round quality of tobacco was obtained from the Timor-Vorstenland line Djombor. Of the Chlorina crosses Y.10-788 x Chlorina F_1 and KBS. x Chlorina F_1 were best, though final judgment on the new Y.10-788 x Chlorina F_1 cannot be reached on the results of the single trial here reported. The same holds for the new crosses Timor x Chlorina F_1 and E3K 18-19 x Chlorina F_1 .

A comparison of the F_5 s from KW.10 x Chlorina (F_4) and KW.10 x Chlorina (F_5) showed that the Chlorina form has not deteriorated.

Some new crosses with Timor v. Dj. underwent their first trials and Timor x Y.10-788 F_1 , Timor x Y.10-P.S. F_1 and Timor x KBS. F_1 , which will very soon be included in the variety trials, deserve mention.

The most recent selections from the hybrid progenies of the Deli x Vorstenland cross, in spite

of their marked brightness, dryness and good leaf shape, received unfavourable comment for their dead colouring—an undesirable feature for a Vorstenland tobacco.

Judging from the field trials of recent years Timor V. Dj. and KBS. x Chlorina F₁ must now be regarded as the best varieties for practical purposes.

The Timor V. Dj. seed is a mixture of F₁₀ and F₁₁, so selection and control must still be maintained.

Two variety trials comprising the main varieties used by planters and Timor V. Dj. showed that in a completely healthy plantation Timor V. Dj. gave the same yield as the other varieties estimated in grammes of dried product per plant harvested. When the yields were calculated on the acreage (where the number of plants that fail are taken into account) Timor V. Dj. produced considerably more per bouw than KBS. x Chlorina F₁, the highest yielder among the rest.

KBS. gave the highest yield in grammes of fermented product per plant harvested.

The Chlorina crosses and the EK "D" have the greatest leaf length.

Timor V. Dj. giving a bright, dry tobacco was unanimously approved as the best as regards quality. The Chlorina hybrids come next and the Kanari's, and the EK-D's were the worst. KW.10 is less inferior than Kanari 1913.

In other qualities, e.g. leaf development, quality, lightness, dryness, burning properties, the different varieties showed agreement with the previous findings based on numerous experiments. Selection experiments, made to compare some individual and bulked selections of Timor V. Dj. with the bulked Timor strains distributed to estates in 1937 and 1938, seemed to show that the mixtures are preferable as long as the same seed is used under very varied conditions on all the estates.

Infection of young plant material was used by the Vorstenland Tobacco Experiment Station in determining the most resistant Timor lines.

Some experiments on the effect of manures on burning properties were carried out.

Research on field plot technique showed that the number of pickings could be reduced from three to two with advantage, especially in variety trials; but for fundamental research and work on manuring more pickings are necessary.

Dr Bär began an investigation on the possibility of applying Fisher's methods to tobacco to eliminate soil differences, but unfortunately the experiment could not be completed.

Experiments on one estate indicated that the most favourable orientation for plantations was East to West.

Tests of samples from the 1937 crop—varieties mainly showed Y.10 in general had the best aroma and flavour. KBS. and Chlorina x KBS. F₁ came next; Timor V. Dj. and Kanari ranked last; and there were indications that KW.10 is improved in aroma and flavour by being crossed with Chlorina. On the whole these conclusions confirm those of the previous years.

430. KOSTOFF, D. 633.71:576.16:576.312
**Relation degrees in phylesis of certain *Nicotiana* species determined
 by cytogenetic analysis.**
 Genetica 1940 : 22 : 215-30.

The author groups the known American and Australian species of *Nicotiana* according to their chromosome number and proceeds to a discussion of the groups.

On morphological and cytogenetical grounds the species with 9 and 10 chromosomes can be classified into a section (1) corresponding to Goodspeed's *alata* group.

The species with 12 and 24 chromosomes need to be divided into several groups on the basis of their morphological appearance and cytogenetic behaviour; the *Tomentosa* section (2) which includes *N. tomentosa*, *N. wigandoides*, *N. tomentosiformis*, *N. glutinosa*, *N. silvestris* and *N. Tabacum*; the *Paniculata* section (3) including *N. paniculata*, *N. cordifolia*, *N. solanifolia*, *N. Raimondii*, *N. Benavidesii*, *N. undulata*, *N. rustica*, and *N. glauca*; the *Attenuata* section (4) with *N. attenuata*, *N. Miersii*, *N. corymbosa*, *N. caudigera*, *N. multivalvis*, *N. acuminata*, *N. Clevelandii* and *N. Bigelovii*; the *Trigonophylla* section (5) with *N. trigonophylla*, *N. Palmeri* and *N. nudiculis*; the *Repanda* section (6) with *N. repanda*, *N. Stocktone* and *N. nesophylla*; a doubtful *Cavanillesii* group (7) with *N. Cavanillesii* and some unidentified species from Scafati. The Australian species are all included in a section (8) by themselves and their peculiarities are discussed in detail.

R. M. I.

431. CLAUSEN, R. E. 633.71:576.356.4
Monosomic analysis in *Nicotiana Tabacum*.
 Genetics 1941 : 26 : p. 145. (Abst.).

Twenty or more monosomic types of *N. Tabacum* have been isolated. Their production and analysis and their uses for genetic studies are outlined.

432. SMITH, H. H. 633.71:576.356.4
Heteroploid types of *Nicotiana* resulting from colchicine treatment.
 Collecting Net 1940 : 15 : p. 173. (Abst.).

Tetraploids were obtained in a large number of *Nicotiana* species by treating germinating seeds with colchicine solutions. A haploid *N. Langsdorffii* plant was also obtained and this produced a 2n-1-1 branch. A triploid *N. Langsdorffii* plant was crossed with diploid *Langsdorffii* and *Sanderae* and the progeny types with extra chromosomes were studied.

433. NOGUTI, Y., 633.71:576.356.5:581.143.26
 OKA, H. and 633.71:576.356.5:581.192
 ÔTUKA, T. 633.71:576.356.5:581.04
Studies on the polyploidy in *Nicotiana* induced by the treatment with colchicine. II. Growth rate and chemical analysis of diploid and its autotetraploid in *Nicotiana rustica* and *N. Tabacum*.
 Jap. J. Bot. 1940 : 10 : 343-64.

Autotetraploids produced by colchicine treatment from *N. rustica* var. *brasilica*, *N. Tabacum* var. *Yellow Orinoco* and var. *Kokubu* were compared with the respective diploids. The seeds of the tetraploids were frequently wrinkled or shrivelled, germination was low and slow and numerous seedling abnormalities were noticed, probably due to heteroploidy. Characteristic features of the autotetraploids were slower growth, thicker leaves and later flowering and fruiting than the diploids. In *N. Tabacum* the tetraploids were prone to wilting. Chemically the tetraploids had slightly more dry matter, more nicotine, organic acid, nitrogen, ether extract, resin, soluble ash, calcium, potassium and magnesium but less sugars, both reducing and non-reducing, sulphuric acid and phosphorus.

434. BAILOV, D. 633.71-1.524:582(49.7)
(Data on the component varieties of the tobaccos in the Gorna Djumaja district).
 Rev. Inst. Rech. Agron. Bulg. 1937 : 7 (4) : 3-56.

The ecological and economic conditions of the tobacco growing district in the Djumaja region are reviewed with detailed observations on the history and introduction of the numerous varieties into the region. The origins of certain types is attributed to segregation from the very varied local populations, to mutation, or in some cases, to the production of intermediate forms by hybridization. In addition the selection of certain types regarded rightly or wrongly as new is also held to have played its part in the development of new forms. The individual varieties in the local population are described in detail with special reference to the leaf and inflorescence and also with information on their type, distribution and economic use and importance. Some illustrations of the plants and leaves are included in this extensive survey which terminates with a bibliography of 22 references.

435. 633.71-2(47)
(Symposium on diseases of tobacco and *Nicotiana rustica*).
 Vsesojuznyi Naučno-Issledovatel'skii Institut Tabáčnoi i Makhoročnoi Promyšlennosti imeni A. I. Mikojana (VITIM) (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1940 :
 No 141 : Pp. 196.

The symposium contains the following articles of interest to tobacco breeders:—

- Levykh, P. M. (The effect of temperature and air humidity on the affection of tobacco with powdery mildew (*Oidium tabaci Thuem*)). (pp. 97-111).

The process of infection and the factors influencing it, such as differences of temperature and humidity, were studied. It was found that under optimum conditions for infection the reaction of a variety could be determined on young seedlings or on a single leaf. In this way it has been possible to select resistant varieties from amongst the world collection.

Khudyna, I. P.

(*The relation of some Nicotiana Tabacum L. varieties and some Nicotiana species to the affection with tobacco-mosaic virus*). (pp. 112–24).

Investigations have been made on 711 varieties of *N. Tabacum* and 15 other species. None of the 711 varieties proved to have a resistance equal to that of the variety Ambalema but clear varietal differences in reaction and in the types of symptom were detectable. Certain varieties, which are enumerated, were very little affected and almost or quite free from necrotic spots. The varieties showing the most pronounced effects are also listed. Of the other species tested *N. glutinosa* was the most resistant. This species and the variety Ambalema are therefore regarded as most promising for breeding for resistance. *N. glutinosa* has the advantage that it is almost immune and does not carry the virus and its resistance is inherited monofactorially, not bifactorially as in Ambalema. Owing to the sterility of its hybrids with *N. Tabacum* however it is necessary to work with some polyploid derivative such as *N. digluta*.

436. SIMURA, T.

633.72–2.111–1.521.6

(**On the frost resistance of tea plants**).

Proc. Crop Sci. Soc. Japan 1940 : 12 : 98–114.

The following correlations have been established as regards frost resistance in tea during the very cold season only:—

The higher the frost resistance of a variety the lower the water content of the tissues and the higher the osmotic pressure of the cell sap in the leaves. On the other hand the lower the frost resistance, the higher the resistance to potassium iodate in a cultural solution and the better the leaf stains with eosin.

437. MENDES, A. J. T. and

BACCHI, O.

633.73:576.356.52

Observações citológicas em *Coffea*. V. Uma variedade haploide (“di-haploide”) de *C. arabica* L. [**Cytological observations on *Coffea*. V. A haploid variety (“di-haploid”) of *C. arabica* L.**].

J. Agron., S. Paulo 1940 : 3 : 183–206; also Bol. Téc. Inst. Agron. Estado, Campinas 1940 : No. 77 : Pp. 26.

Examination of a number of plants of the “peaberry” type (var. *monosperma*) has shown them to be haploids (di-haploids, $2n = 22$), their high degree of sterility being the cause of their low productivity and one-seeded fruits. The usual meiotic irregularities were observed and are described. The number of bivalents observed varied from 1 to 6, which would indicate that *C. arabica* is not a simple autotetraploid.

Fruits were obtained by open-pollination and also by pollinating emasculated plants with normal coffee; the progeny in both cases appeared to be tetraploid ($2n = 44$).

438. FRAHM-LELIVELD, J. A.

633.73:581.481:581.148:576.356

Ontstaan en voorkomen van rondboon en voosboon bij koffie. (**Origin and occurrence of round beans and spongy beans in coffee**).

Bergcultures 1940 : 14 : 1358–62.

Among the possible causes of round beans, aborted ovules occur more commonly in Conuga clones and the Kawisari, so-called hybrid coffee, than in Robusta. In order to determine whether the Conuga clones possibly differed genetically as regards the basis for round bean formation (i.e. embryo-sac abortion) an investigation was undertaken of the condition of the ovules in a number of Bgn. and S.A. clones at the point when fertilization should be possible.

Slight differences were found between the clones as regards round bean formation but much greater differences occurred between samples from one and the same clone gathered at different times of the year; and a relationship was found between the resting period, from November to February (when reserves necessary for the formation of normal ovaries are being stored).

Studies of the nutritive requirements of the coffee plant during flowering and the fruit setting cycle should, with manuring experiments as well, reveal which elements are essential for the development of the young ovary and thus throw light on the round bean phenomenon.

The hybridity of Conuga may also contribute to its greater lability in development as compared with Robusta.

In discussing the occurrence of spongy beans in Kawisari and in Java hybrids as a result of defective endosperm development and chromosome aberrations (cf. “Plant Breeding Abstracts”, Vol. IX, Abst. 103), an experiment is recorded in which branches of Kawisari plants

were pollinated with Conuga, Kawisari and Arabica pollen. The Arabica pollen was deficient in quantity and gave a poor set. Incidentally Arabica seldom flowers at the same time as Kawisari. The set of berries with Conuga was larger than usual and the percentage of normal beans from the number of flowers pollinated exceeded 5, but the corresponding percentage with Kawisari was 10.3%.

Cytological examination revealed that in the Conuga cross 80% of the nuclei in the endosperms investigated had too few chromosomes, whereas in the cross with the Kawisari pollen the corresponding figure was 37%. This difference cannot be attributed solely to specific differences since, when chromosome doubling of the Conuga complement has happened to occur, quite normal beans have resulted.

The problem is to be investigated further along various lines.

The discussion that followed dealt with the possible genetic basis of yield differences in Kawisari.

439. OCHOA, H. and CHAVARRIAGA, E. 633.74:575(86)
Apuntes sobre el cultivo del cacao. (**Notes on cacao cultivation**).
Rev. Fac. Nac. Agron. Colombia 1940 : 2 : 442-78.

Descriptions are given of the species of *Theobroma* occurring in Colombia. A vast number of varieties and forms of *T. Cacao* occur, many of them resulting in all probability from natural hybridization with wild species. The various types and their commercial characteristics are described and the most important characteristics to be taken into account in making selections are discussed. These are vigour and health of tree, early bearing, yield, quality, and resistance to pests and diseases.

Yield figures are given which show that in two successive years, 1912 and 1913, seven trees were in both years above the average, three very close to the average and five trees gave conflicting results in the two years.

440. HARLAN, J. D. 633.79-1.557:581.6
What new varieties of hops did in N.Y. in 1939.
Amer. Brewer 1940 : 73 (6) : p. 29; (7) : 21-22.

The yield and resin content of a number of hop varieties were determined. The Manitoba seedlings (including Brewer's Gold, Bullion and OB.53), are recommended to growers because of their high resin contents and desirable flavours.

AROMATIC PLANTS 633.8

441. HAGIWARA, T. and OOMURA, Y. 633.842:575.182:581.174
633.842:575.24
(**Plastid inheritance of variegation in *Capsicum annuum***).
Jap. J. Genet. 1939 : 15 : 328-30.

A series of crosses between green leaved and variegated varieties of *C. annuum* gave the following results:—

In two crosses, in which the variegated type was the pollen parent, the F_2 showed a Mendelian monohybrid ratio for variegated leaf. This may be attributed to the change of some green plastids into white owing to repeated "exo-mutation" in the F_1 , primarily induced, however, by genes within the nucleus. In the absence of genes of the latter type—as another similar cross showed—green leaf breeds true.

"Auto-mutation", involving the (spontaneous?) change of white plastids into green, also occurred in two crosses and this change may be interpreted as taking place in the cytoplasm independently of the nucleus.

Variegated varieties, on inbreeding, did not segregate green leaved progeny, yet on being crossed with variegated or with green leaved forms, the green leaved character segregated out to some extent in F_2 . From this it is surmised that although "auto-mutation" occurs independently of genes, the change in the cytoplasm, due to crossing, appears to be in some way connected with the "auto-mutation" phenomenon.

442. COCHRAN, H. L. 633.842:582
Characters for the classification and identification of varieties of *Capsicum*.
Bull. Torrey Bot. Cl. 1940 : 67 : 710-17.

The average leaf length, width and leaf index, the average fruit length, width and fruit shape

index and the fruit flavour (mild or pungent) of 59 named varieties of peppers (*C. frutescens*) are given in a table. It is suggested that leaf and fruit index may be valuable together with certain other plant characters in the classification of pepper varieties grown under comparable conditions but would be of little value when used alone.

OIL PLANTS 633.85*

443. PLOTNIKOV, A. I. 633.854.78:581.162.3
(**Selectivity of sunflower at fertilization**).
Jarovizacija 1940 : No. 2 (29) : 94-96.

Emasculated sunflowers were pollinated with a mixture of pollen from other plants of the same variety and from other varieties. The examination of the progenies showed that some varieties had been fertilized almost exclusively by pollen from other varieties, while two varieties, Nos. 8,281 and 1,846, produced progeny mainly of the maternal type.

444. DOBREV, K. 633.854.78:581.48:575
633.854.78-2.7-1.521.6
(**Observations on the inheritance of the protective layer of cells in the sunflower**).
Rev. Inst. Rech. Agron. Bulg. 1938 : 8 (1) : 97-103.

The importance of this protective layer of cells in sunflower seeds against infestation by *Homosoma nebulella* has led to further genetical studies (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1025), on this occasion in Bulgaria.

The author has found the presence of the protective layer to be a dominant character, though the statistical data so far available are inadequate to determine exactly the mode of segregation.

MEDICINAL PLANTS 633.88†

445. BOEIMAN, H. A. C. 633.88-1.524(92)
De mogelijkheden van de cultuur van eenige minder bekende geneeskruiden en hare toepassing. (**The possibilities of cultivating some of the less well-known medicinal plants and their application**).
Bergcultures 1940 : 14 : 1160-66.

An account is given from the historical and practical aspects of the uses, cultivation and prospects of the economic development of the following plants in the N.E.I. : *Aloë* species, tamarind, *Cephaelis ipecacuanha*, *Cola* species and *Piper methysticum*.

446. BONISTEEL, W. J. 633.881.6:576.356.5:581.192
(**Polyploidy in relation to chemical analysis**).
J. Amer. Pharm. Ass. 1940 : 29 : 404-08.

Reviewing what is known of the toxicity of different species and forms of aconite, the author points out that the diploid species ($2n = 16$) are non-toxic, the triploids and tetraploids are toxic and the only hexaploid so far tested is non-toxic. Experiments are in progress to double the triploid clone known as Sparks Aconite to see whether it will lose its toxicity as a hexaploid. Colchicine is being used to this end and it is also possible that a hexaploid will arise spontaneously, since hexaploid sectors have been found in the roots.

It is also mentioned that in interspecific hybrids of *Cinchona* species the relative and absolute contents of the different alkaloids are different from those of the parents. *C. succirubra*, *C. Ledgeriana* and their hybrid had respectively 2.54, 3.81 and 6.77% of quinine.

RUBBER PLANTS 633.91‡

447. ZWEEDE, J. C. 633.912:581.481:578.08
Het splitsen van *Hevea*-kiemplanten. (**The splitting of *Hevea* seedlings**).
Bergcultures 1940 : 14 : 1271-75.

Full details are recorded of a series of tests made to determine the relative merits of the Ramaer (R) and Gambar (G) methods of dividing *Hevea* seedlings to obtain twin plants. The Gambar modification of Ramaer's technique consists in making the incision (which is to divide

* See also Abst. 315 (*Aleurites montana*), Absts 312, 313, 315 (Oil Palm); Absts 328 and 329 (Sunflower).

† See also Absts 313 and 315 (*Cinchona*).

‡ See also Abst. 315.

the seedling *not* exactly in half) run in a lateral direction on the epicotyl at the level just above the point of union of the cotyledons with the stalk, thus leaving the plumule intact except slightly to one side at its base. This method ensures (1) the rapid development of one of the twin plants; (2) no loss of seedlings from dying off or cutting; (3) the possibility of more rapid transplantation since the seedling that has grown quickly comes loose from the seed sooner and the other seedling can retain the seed remnant when being transplanted.

Full particulars are given of an elaborate confirmatory experiment in which Ramaer's method and the new one were compared with a view to detecting any possible disadvantages of the new technique. The results showed (1) that with the Gambar method the shorter plants that developed from the new bud subsequently formed on the epicotyl of the smaller portion of the divided seedling were as tall as those obtained by Ramaer's method; and (2) that the taller plants (i.e. those that had grown from the seedling portion that had the entire plumule attached) were $6\frac{1}{2}$ cm. or 28% longer than the Ramaer seedlings. Moreover the percentage number of plants that took and of extra plants obtained by the two methods was about equal namely 94.6 and 89.2 respectively by the Ramaer method and 95.4 and 88.5 respectively by the Gambar method.

Another experiment showed that the more vigorous twin did not develop at the expense of its partner, whose smaller size was due to isolation of its cotyledon by the incision, causing reduced nutrition.

Leaving the remnant of the seed attached to the seedling when being transplanted appeared to have had no appreciable effect on the growth of the plant.

Though evidence is available from another source that splitting of the seedlings does not subsequently cause any stoppage or retardation of growth and a consequent delay in coming into tap, the author intends to verify this point with his present material.

This paper also contains many useful hints on the best methods of transplanting, the preparation of seedbeds and other problems of cultivation of twin rubber plants.

Carried out with care the splitting of *Hevea* seedlings is, in the author's opinion, financially well worth while.

448. JONG, W. H. de 633.912-1.557:581.165.1(92)
Productiecijfers van hevea-cloon Gondang Tapen I. (**Yield figures of the rubber clone Gondang Tapen I**).
Bergcultures 1940 : 14 : 1223-26.

Yield data from three estates are cited for the Gondang Tapen I clone which is characterized as a clone with a good flow of latex; good quality of bark and bark renewal; a small and erect crown—so that the number of trees that can be raised per ha. is large and, if necessary, they would be suitable for growing in permanent mixed cultivation with coffee—good resistance to wind damage; good, dark green foliage and good growth.

A few defects are mentioned, but are not regarded as of a decisive nature.

Gondang Tapen I has yielded well on its own stock, as well as on other stocks.

449. SCHMÖLE, J. F. 633.912-1.557:581.165.1(92)
Kort verslag tot ult. 1939 van de toetstuienen van cloonen en zaailingfamilies in Polonia. (**Short report up to the end of 1939 on the test plantations of clones and seedling families in the Polonia plantation**).
Arch. Rubbercult. Ned.-Ind. 1940 : 24 : 455-69.

A continuation of the earlier records of performance under conditions in the Polonia experimental plantations (cf. "Plant Breeding Abstracts", Vol. X, Abst. 200).

Yields and other characteristics of 13 of the best clones are given with notes compiled from annual data on their growth, shape of stem, susceptibility to wind damage, fracture and diseases, and on bark renewal and wound recovery.

Among the seedling families which did well on the whole, the best producers were 36 x 36 and the illegitimate families 152, 157, 163, 185 and 308—though 36 x 36 and illegitimate 163 seem susceptible to brown bast.

Considering all the available data from the plantation, it is concluded that the yields of the illegitimate seedlings as compared with those from the monoclonal plantings of high yielding clones show that in yield the seedlings are at least equal to the buddings in productivity.

The methods of testing, spacing, thinning, etc. are also discussed.

450. MEDVEDEV, P. F. 633.913:575(47)
(The first varieties of *Asclepias*).
 Soviet Plant Industry Record 1940 : No. 1 : p. 106.
 The best clones so far selected contain up to 6.3% of rubber.
451. MYNBAEV, K. 633.913:575(47)
(New forms of *Taraxacum kok-saghyz*).
 Soviet Plant Industry Record 1940 : No. 1 : p. 105.
 Two new selections, one with a rubber content of 18–20% are described.
452. KOROLEVA, V. 633.913:581.6:575(47)
(Breeding *Taraxacum kok-saghyz*).
 Soviet Plant Industry Record 1940 : No. 1 : 104–05.
 Selections of *T. kok-saghyz* with rubber contents from 15 to 16.5% are being multiplied for distribution.

FRUIT TREES 634*

453. TETEREV, F. K. 634:575(47)
(The scientific legacy of V. V. Pashkevich).
 Soviet Plant Industry Record 1940 : No. 1 : 9–19.
 Quotations from the writings of Pashkevich are given in illustration of his appreciation of the importance of the role of cross-pollination in fruit breeding, his belief in the existence of graft hybrids and his admiration of the work of I. V. Michurin. A list of Pashkevich's most important works completes the article.
454. ŠIRJAEVA, K. A. 634.1:575.3
(The application of the mentor in bringing-up hybrid seedlings).
 Sadovodstvo (Horticulture) 1940 : No. 7 : 24–25.
 The influence of standard varieties upon young hybrids of *Ribes* and apple was tried by grafting the hybrids on to the standard varieties and these on to the hybrids. The results however are not reported.
455. STEINBOCK, V. D. and 634.11:575(47)
 ČUKANOVA, N. V.
(Michurin's variety "Northern Bužbon").
 Sadovodstvo (Horticulture) 1940 : No. 7 : 26–27.
 The apple variety is characterized by large fruits of good shape and flavour, is a good keeper, resistant to frost and sun damage and to scab.
456. Z, L. 634.11:575"793"
 Varietà precocissime di melo a Tripoli. **(Excessively early varieties of apple in Tripoli).**
 Note Fruttic. 1940 : 18 : 73–75.
 Descriptions are given of two varieties of apple which produce ripe fruits in the first fortnight of June in Tripoli. The Melo di S. Giovanni of Sicily is similar. These apples are regarded as of possible interest as parents for breeding early varieties.
457. DUKA, S. Kh. 634.11:575.12:575.3
(The influence of nutrition and the production of apple seedlings with the characteristics of cultivated varieties).
 Jarovizacija 1940 : No. 2 (29) : 90–92.
 By cutting 1–2 year old hybrid apple seedlings down to the ground the resulting trees were found to approach more closely to the cultivated types than to the wild type, an effect which is attributed to the influence of the more abundant supply of food materials available to the young regenerated shoots.
458. JAKOVLEV, P. N. 634.11:575.257
(Influence of the mentor on the transference of pigments).
 Jarovizacija 1940 : No. 1 (28) : 11–13.
 A complex hybrid of *Cerasus Besseyi*, *Prunus Munsoniana*, *P. salicina* and *Persica vulgaris* was grafted on to red and green leaved rootstocks. The leaves of the graft on the red stock

* See also Abst. 315 (*Koemis Koetjing*).

also became red, though in form they remained unchanged. The author concludes that if the influence of the rootstock is sufficiently prolonged the progeny of the scion will also be affected.

459. KEMMER, E. and 634.11:581.143.7:581.165.711:576.356.5
 SCHULZ, F. 634.13:581.143.7:581.165.711:576.356.5
 Die Bedeutung des Sämlings als Unterlage. (**The importance of the seedling as a stock**).
 Landw. Jb. 1939 : 89 : 114-39.

The increasing use and importance of seedlings for stocks in replacing those vegetatively reproduced is pointed out.

Experiments were made on a number of varieties of apples, pears and plums to determine their value as seed producers and as seedlings. Among the apples and pears examined the authors find the germination capacity of the diploid varieties on the whole to be far higher than that of the triploids.

As seedlings, some varieties showed remarkable uniformity, others were quite unsuitable. Among apples in their first year as seedlings, W. W. Taffetapfel, Baumann's Reinette and Kleiner Langstiel are especially recommended; of the pears Träublesbirne, Gellert's Butterbirne and Wilde Eierbirne. The progeny of controlled crosses were also tested but in general they showed no advantages over the product of open pollination. Of the plums, the Myrobalan type was more satisfactory than the St. Julien type. R. M. I.

460. TSELIKOV, R. N. 634.11-2.111-1.521.6:575(47)
 (**Michurinites of the Sverdlovsk region—participants in the Soviet Agricultural Exhibition**).
 Sadovodstvo (Horticulture) 1940 : No. 6 : 27-30.

By sowing the seeds of standard varieties of apple, selecting the hardiest seedlings and treating them in the way indicated by Michurin, promising varieties capable of growing in the Urals have been obtained and they are described.

461. 634.25:575(74.9)
 634.256:575(74.9)

New twentieth century peaches bred and tested in New Jersey.

Propagated and Distributed by The New Jersey Peach Council, Inc., New Brunswick, N.J. 1940-1941 : Pp. 9.

Descriptions are given of the following new varieties of peaches, released through the New Jersey Peach Council and bred at the New Jersey Agricultural Experiment Station : Raritan Rose, Triogem, Newday, Sunhigh, Redrose, Goldeneast, Midway, Pacemaker, Summercrest, White Hale, Afterglow and the nectarine Garden State. Information on parentage, flower type, bud set and earliness of maturity is given in a table.

462. JOHNSTON, S. 634.25:575"793"
The Redhaven peach.

Quart. Bull. Mich. Agric. Exp. Sta. 1940 : 23 : 93-95.

The "Redhaven" peach, which originated from a cross between Halehaven and Kalhaven, is an early maturing variety. It matures about 30 days earlier than Elberta and is vigorous and very productive. It produces an abundance of pollen and is self-fertile.

463. DERMEN, H. 634.25:576.356.5:581.04
Periclinal and total polyploidy in peaches induced by colchicine.
 Genetics 1941 : 26 : p. 147. (Abst.).

A tetraploid-diploid sectorial chimaera obtained by colchicine treatment has been previously described (see "Plant Breeding Abstracts", Vol. IX, Abst. 1603). Two flowers have been formed on one of its tetraploid branches but these flowers produced haploid pollen grains. Cytological examination showed that only the epidermis of the branch was tetraploid and that the other layers were diploid. A second tetraploid has now been obtained by colchicine treatment and this plant appears to be wholly tetraploid and not a chimaera like the first.

CITRUS FRUITS 634.3

464. SOKOL'SKAJA, B. P. 634.3:581.163
(A new method of producing parthenocarpic citrus fruits).
 Soviet Subtropics 1940 : No. 10 (74) : 36-39.

By cutting off the style at the base and bagging the flower, parthenocarpy was induced in

nearly all flowers, very few of which dropped. The fruits produced were large, seedless and of good flavour; they contained larger quantities of vitamin C and sugar and less acid than normal fruits: treated trees produced considerably larger numbers of fruits than controls untreated and the individual fruits were larger.

465. FROST, H. B. 634.32:575(79.4)
The Pearl tangelo—a new citrus variety.
 Calif. Citrogr. 1940 : 25 : p. 346.

A promising tangelo, named the Pearl, has been obtained at the University of California Citrus Experiment Station from the cross Imperial grapefruit female x Willow Leaf mandarin. The fruit resembles a small orange in appearance, is solid and juicy, and has a mild but distinctive flavour. The yielding ability of the variety and the keeping qualities of the fruits have not yet been tested.

NUTS 634.5

466. JABLOKOV, A. S. 634.54:575.12
(New facts in the sphere of controlling dominance).
 Jarovizacija 1940 : No. 1 (28) : 81–38.

Crosses were made between Southern varieties of filbert and wild forms of *Corylus avellana* L. The hybrids of different combinations varied. The hybrids of the variety Barcelona x *C. avellana* resembled the filbert parent but were much more vigorous and frost resistant. In the first four years of growth the frost resistance became progressively greater. The reciprocal hybrids were much less successful and not at all hardy.

PALMACEOUS AND OTHER TREE FRUITS 634.6

467. TAMMES, P. M. L. 634.61:581.47
 Over de ontwikkeling van de vrucht van den klapper en de factoren, welke van invloed zijn op de hoeveelheid copra per noot. **(On the development of the fruit of the coconut and the factors that influence the quantity of copra per nut).**
 Bergcultures 1940 : 14 : 1101–07; also Landbouw 1940 : 16 : 385–95.

In continuation of his previous study on the biology of flowering of the coconut (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1326) the author here investigates the different stages of development of the nut and the morphological and other changes accompanying them. A chemical analysis of the milk was also made and information was collected about the influence of environmental conditions on development and about the gathering of the crop.

468. SAL'KOVA, A. K. 634.63–1.524(47)
(The biochemical study of the olives of Eastern Transcaucasia).
 Soviet Subtropics 1940 : No. 8 (72) : 28–30.

The proportion of flesh to stone and the oil content were determined in a number of varieties principally with the object of choosing forms with the maximum oil content and with the maximum proportion of flesh respectively, for intercrossing. Varieties with an oil content of from 43 to 51.2% in the whole fruit and from 66.76 to 73.11% in the flesh have been found; the flesh percentage varies from 71 to 90.74 and the fruit weight from 2 to 8.5 gm.

SMALL BUSH FRUITS 634.7

469. DRAIN, B. D. 634.711–2–1.521.6
 634.75–2.112–1.521.1
Developing of new horticultural varieties for Upper South. Raspberries and strawberries given attention.
 Sth. Flor. 1940 : 49 : No. 21 : 7, 15.

Tennessee and adjoining areas need varieties of all kinds of garden plants that are adapted to its soils and climate. Two new varieties—the Tennessee Autumn red raspberry (cf. Abst. 472) and the Tennessee Supreme strawberry (cf. also Abst. 471)—which have been bred for Tennessee conditions, are described in this article.

470. DRAIN, B. D. 634.711-2-1.521.6

Tennessee Autumn red raspberry.

Circ. Tenn. Agric. Exp. Sta. 1940 : No. 70 : Pp. 4.

The Tennessee Autumn red raspberry originated from the cross seedling 181 (Latham x Van Fleet) x Lloyd George. At Knoxville (Tennessee) the spring crop ripens in late May to June and the autumn crop in September and October. It shows considerable cold resistance, appears to escape mosaic, has been entirely free from leaf curl and is only slightly susceptible to leaf spot. The fruit is large and of good flavour. The new variety is a vigorous grower.

471. FISTER, L. A. and DRAIN, B. D. 634.75-2.112-1.521.6

Tennessee Supreme strawberry.

Circ. Tenn. Agric. Exp. Sta. 1940 : No. 68 : Pp. 4.

The Tennessee Supreme strawberry, a seedling selected from the cross Missionary x Premier, is vigorous and drought resistant. It produces a high percentage of first class fruits. The fruits have good freezing qualities and they are very suitable for the frozen food trade.

472. 634.75-2.8-1.521.6

American Fruit Grower presents annual nationwide variety survey : strawberries.

Amer. Fruit Gr. 1940 : 60 : No. 10 : p. 8.

The Blakemore yellow-leaf resistant variety is now the most popular strawberry in the U.S.A. The original Blakemore strawberry was susceptible to yellow-leaf disease and the one yellows-free strain was found by chance.

473. DERMEN, H. and BAIN, H. F. 634.76:576.356.5:581.04

Periclinal and total polyploidy in cranberries induced by colchicine.

Genetics 1941 : 26 : 147-48. (Abst.).

Tetraploid cranberries have been obtained by immersing the short apices of seedlings in colchicine solutions. Stoma size was used as a criterion for polyploidy in the initial examinations but cytological preparations have also been made.

OTHER FRUITS 634.77

474. MENDIOLA, N. B. and MERCADO, T. 634.771:581.162.3

Introduction and trial culture of Ambon bananas in the College of Agriculture.

Philipp. Agric. 1940 : 29 : 415-30.

Three bananas, Ambon Poetih, Ambon Idjo and Ambon Loemoet, have been introduced into the Philippines from Java and their agricultural characteristics have been studied. Ambon Poetih, which is very closely related or identical with the Gros Michel, was found to produce no seeds both when selfed and when crossed with the Buñgulan and Lantudan bananas.

FORESTRY 634.9*

475. DUFFIELD, J. W. 634.972.1:576.312.35

Chromosome counts in *Quercus*.

Amer. J. Bot. 1940 : 27 : 787-88.

In all the 19 species examined $2n = 24$ chromosomes were found. The accuracy of counts of $2n = 12$ in certain species recorded by other investigators is questioned.

476. DILLEWIJN, van C. 634.972.3:576.354.4:575.127.2

Zytologische Studien in der Gattung *Populus* L. (Cytological studies on the genus *Populus* L.).

Genetica 1940 : 22 : 131-82.

A cytological study of meiosis in the anthers of the following species and natural hybrids of *Populus* :—*P. nigra* L., *P. nigra* L. var. *italica* Du Roi, *P. brabantica* Houtz., *P. gelrica* Houtz., *P. robusta* Schneid., *P. deltoides* Marsh. var. *missouriensis* Henry, *P. serotina* Hartig and *P. alba* L.

R. M. I.

* See also Abst. 315 (*Leucaena* sp.).

477. GRAVES, A. H. 634.972.4-2.421.9-1.521.6:575.127.2
Breeding work towards the development of a timber type of blight-resistant chestnut. Report for 1939.
 Bull. Torrey Bot. Cl. 1940 : 67 : 772-77.

By crossing the American chestnut (*Castanea dentata*) with the Japanese chestnut (*C. crenata*) it is hoped to obtain a forest tree type of chestnut which will be resistant to the blight fungus, *Endothia parasitica*. In general the F_1 hybrids have shown dominance of the American species but the hybrids have some of the blight resistance of the Japanese parent. These F_1 trees have been intercrossed, back-crossed with the Japanese parent and also crossed with the blight-resistant Chinese chestnut, *C. mollissima*. Other hybrid chestnuts have also been obtained. The trees are tested for disease resistance by inoculation with *Endothia*. This work has now been going on for ten years (for previous reports see "Plant Breeding Abstracts", Vol. X, Abst. 556).

478. SCHWEIZER, J. 634.973:575:581.6
 Over lamtoro-soorten als houtleveranciers in een koffiëaanplant. (On
lamtoro varieties as sources of wood in a coffee plantation.
 Bergcultures 1940 : 14 : 1069-77.

The merits of the old lamtoro (*Leucaena glauca*) and the newer types *L. pulverulenta* and *L. glauca* x *L. glabrata* as shade trees and as sources of fuel for coffee drying are discussed. Though 1 ha. of *L. pulverulenta* provides fuel sufficient to dry 3.2 times as much coffee (in a 14 year period) as the lamtoro does, the species hybrid, which dries 2.1 times as much, is regarded on the whole as more suitable for the conditions in the N.E.I.

The relative advantages of the 3 types are also considered from the point of view of the physical and chemical characteristics of their wood and evidence of marked influence of scion on stock is cited with special reference to the effects upon growth and chemical composition of the wood.

Cultural measures suitable for the new lamtoro species are recommended.

479. LAMMERS, R. P. 634.973:575.127.2:581.48
 Een en ander over nieuwe lamtoro-vormen. (A thing or two about new,
lamtoro forms.
 Bergcultures 1940 : 14 : 1168-71.

Attempts in the N.E.I. to obtain lamtoro types that set few seeds have included the importation of *Leucaena pulverulenta* and the discovery of F_1 hybrids of *L. glabrata* x *L. glauca*. Buddings of a non-flowering *L. pulverulenta* on *L. glauca* and also of the F_1 of *L. glabrata* x *L. glauca* (cf. Abst. 315) have proved a great advance on the common lamtoro.

When it was found possible to raise *L. pulverulenta* seedlings, they showed a variety of types, indicating that the original imported material of this species must have been heterozygous. These types included one which does not flower and grows into large trees with abundant dark green foliage and one which up to about half a year old flowers and develops into large trees also with abundant dark green foliage. From these two groups a type was selected for its very open habit which renders it probably superior as shade for Robusta coffee to the existing clone already in use at the various Experiment Stations. Besoeki Station hopes to be able to supply buddings of this new type. *L. pulverulenta* is readily pollinated by *L. glauca*, and another group found in studying the seedlings comprised types whose morphological characters were intermediate between those of *L. pulverulenta* and *L. glauca*, which suggested that the group in question represents the F_1 from a cross between these two species. This assumption was supported by an experimental cross and by observation of *L. pulverulenta* seedlings growing in the vicinity of the common lamtoro. These seedlings resembled the F_1 hybrid type. At a distance of 100 m. in one instance no further cross pollination was found to have occurred. These F_1 types appear to grow much more rapidly in the first year than *L. pulverulenta*. This feature is not so marked in buddings.

The F_1 's also differed in regard to flowering; and clones of mother trees that flower only in the first few months and not again are being investigated as to their practical value.

Selection material is being further supplemented by seedlings raised from the F_1 's and from spontaneous seed from *L. glabrata* x *L. glauca* with a view to mother tree selection.

Buddings of *L. glabrata* were made on *L. glauca*.

This gradual replacement of the common lamtoro by some of the new more desirable forms is

contemplated; that they do not breed true may be countered by an appropriate technique of budding possibly combined with a suitable choice of stocks.

480. BERG, A. 634.975-2.452-1.521.6

A rust-resistant red cedar.

Phytopathology 1940 : 30 : 876-78.

A sixteen year record showed, with few exceptions, that red cedars (*Juniperus virginiana* L.) selected as being very susceptible to cedar-apple rust (*Gymnosporangium juniperi-virginianae* Schw.) at the beginning of an experiment remained susceptible throughout the experiment and those trees originally classed as resistant showed only slight infection in subsequent years. Scions taken from resistant and susceptible trees and propagated by grafting have also behaved like their parents.

VEGETABLES 635*

481. WORK, P. 635:575(73)

More new varieties for 1941. Cos Endive; Honey Gold Melon; 3

Pascal celery strains; Essary canning tomato.

Market Gr. J. 1940 : 67 : 503-04.

BAILEY, D. M.

The Essary tomato.

Circ. Tenn. Agric. Exp. Sta. 1940 : No. 71 : Pp. 4.

The Cos Endive is a new salad vegetable developed by the Ferry-Morse Seed Company. Mature plants resemble large cos lettuce while the young plants are more like Batavian endive. Honey Gold cantaloupe was bred by Mr. Lowden from Honey Dew, Honey Ball, Hearts of Gold and Vegetable Peach. It is early, hardy and gets its flavour from Honey Dew. It has a very small seed cavity.

Three strains of celery of the self-blanching Pascal type have been bred at the New York State College of Agriculture and are now ready for trial and seed propagation. They have been named Cornell 6, Cornell 9 and Cornell 19. All three have vigorous growth, good hearts, thick fleshy petioles, smooth ribbing and less stringiness than the usual self-blanching sorts. Cornell 6 and 19 are more resistant to *Fusarium* than Cornell 6, which has the thickest and fleshiest petioles but they are shorter and less uniform in length than in the other two strains. The new strains have been selected from a cross between a selfed line of Golden Self-Blanching and a commercial strain of Utah.

The new canning tomato, Essar, was developed by the U.S. Bureau of Plant Industry in co-operation with the California Agricultural Experiment Station. It has already been described in "Plant Breeding Abstracts", Vol. XI, Abst. 228.

The Essary tomato is to be commercially released by the experiment station at Knoxville, Tennessee, after some 14 years work by the late S. H. Essary. It has been developed from Marglobe by mass selection for resistance to wilt and to defoliation by *Alternaria* and *Septoria*. It exceeds Marglobe in yield and quality.

482. 635.00.14(48.5)

LAMM, R.

635:575(48.5)

Sammanfattning över de jämförande sort och stamförsöken med köksväxter vid Alnarp år 1938. (**Summary of the comparative trials with varieties and strains of vegetables at Alnarp in the year 1938**). Årsskrift från Alnarps Lantbruks-, Mejeri- och Trädgårdsinstitut, Malmö (1939) 1940 : 1-24.

LAMM, R.

Redogörelse för stamförsök och statskontroll av köksväxtestammar vid statens trädgårdsförsök år 1938. (**Report on trials of strains and state control of vegetable strains in the state horticultural trials in the year 1938**).

Ibid (1939) 1940 : 25-134.

These two annual reports give full particulars of the official variety trials of different kinds of

* See also Abst. 315 (Dadap); Abst. 326 (Carrots).

vegetables (and melons) in Sweden as well as an account of the system of control of high grade vegetable seed production and the principles, methods and criteria adopted in testing and grading varieties and strains.

Where there is a possibility of cross-pollination or insufficiently stringent selection having impaired a variety, its genuineness and purity are determined in a systematic series of tests. New varieties and improved strains are recorded with an indication of their origin.

In addition to the extensive work on trials, some research on somewhat the same lines as in the previous year (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 214) was pursued (as far as facilities permitted) on: earliness in carrots, winter storage properties of carrots and white cabbage, breeding of beans and peas, genetical studies of peas, lettuce and Brussels sprouts, photoperiod effects in lettuce, over-wintering and sex types in spinach, study of the relation between cold resistance and pentosan content of cabbage types and observational work on radishes.

483. NICHOLS, C. 635.25:576.356
Spontaneous chromosome aberrations in *Allium*.
 Genetics 1941 : 26 : 89-100.

NICHOLS, C.
Spontaneous chromosome aberrations in root tips of *Allium*.
 Collecting Net 1940 : 15 : 171-72. (Abst.).

Spontaneous chromosome aberrations were observed in dividing root tip cells of germinating seeds of ten varieties of onion (*A. Cepa*). The frequency of aberrations varied greatly in different varieties—from 1.6% aberrations in White Portugal to 13.0% in Prizetaker. Within varieties there was an increase in frequency of aberrations with increased age of seed. As no aberrations were found in the root tip divisions of onion bulbs of the same varieties as the seeds, it is suggested that dehydration plays some part in producing the chromosome breakages found in the root tips of germinating seeds.

484. INOUE, Y. 635.34:576.356.5:581.04
Colchicine-induced tetraploid in Chinese cabbage (*Brassica pekinensis* Rupr.)]
 Jap. J. Genet. 1939 : 15 : 318-19.

Colchicine treatment of the variety Aichi Hakusai is stated to have resulted in the production of numbers of tetraploid plants and a couple of probable octoploids with some mosaics of $2n$ with $4n$ and of $4n$ with $8n$.

The flowers of $4n$ and $8n$ had large petals some of which have undulating edges. Cases of anamorphosis occurred, particularly in $8n$ plants.

Artificial pollination was unsuccessful.

485. KRAUS, J. E. 635.34:582
Chinese cabbage varieties, their classification, description, and culture in the Central Great Plains.
 Circ. U.S. Dep. Agric. 1940 : No. 571 : Pp. 20.

The varieties of Chinese cabbage (*Brassica pekinensis*), grown in the United States, are classified into seven groups and a type variety of each group is described. The type variety of Group 7, New Joy, is not a heading type, is of very little value and resembles a type previously described as Pak-Choi cabbage or *Brassica chinensis*.

486. BERGER, C. A. 635.41:576.356.5:576.312.315
A new criterion of the degree of polyploidy of "resting" nuclei.
 Genetics 1941 : 26 : 137-38. (Abst.)

One of the six haploid chromosomes of *Spinacia* has a heteropycnotic satellite. In diploid resting cells the satellites can be seen as two small chromatic bodies in contact with the nucleolus. In the zone of the root where tetraploid and octoploid cells are found the resting nuclei of these larger cells show four to eight chromatic bodies attached to one large nucleolus or distributed among from two to eight smaller nucleoli in the process of fusion. The degree of polyploidy of the resting nuclei can thus be determined by counting the number of these chromatic bodies.

487. KULIKOV, P. I. 635.61:581.162.32
(Revise the rules for spatial isolation of cucurbits).
 Ovošćevodstvo (Vegetable Growing) 1940 : No. 9 : 22-23.

No spontaneous hybridization has been observed when different melon varieties are grown together at distances much less than that prescribed for spatial isolation and it is suggested that the regulations on this point might be relaxed.

488. CURRENCE, T. M.,
 EIDE, C. J. and
 LEACH, J. G. 635.611-2.484-1.521.6:575
The Golden Gopher muskmelon.
 Market Gr. J. 1941 : 68 : 14-16.

The Golden Gopher (previously known as selection 10-38) is an early *Fusarium* wilt resistant variety which also has high eating quality and other desirable characters. It was obtained by repeated self-pollination and selection from a strain which appeared to have a high degree of wilt resistance.

489. BARROWS, F. L. 635.62:575.11:581.331.2
Inheritance in *Cucurbita* pollen.
 Genetics 1941 : 26 : p. 137. (Abst.).

Sharp spined types of pollen appear to be dominant to types with blunt surface spines in *C. Pepo* L. The F_2 data suggest more than a single factor difference.

490. SINNOTT, E. W.,
 BLAKESLEE, A. F. and
 FRANKLIN, A. 635.62:576.356.5
A comparative study of fruit development in diploid and tetraploid cucurbits.
 Genetics 1941 : 26 : 168-69. (Abst.).

Fruit development of diploids and colchicine-produced tetraploids of pure lines of *Cucurbita* and *Lagenaria* has been studied. In one line, organ size at comparable stages (early primordia and flowering) is the same in both diploids and tetraploids; in other lines, the tetraploid is considerably larger in the early stages but fails to maintain this advantage in later development so that mature fruit volume is about the same in both types. Cell volume of tetraploids both in the earliest primordia and at the end of cell expansion is approximately twice that found in diploids. In mature fruits, cell number of the tetraploids is about half that of diploids.

491. BINDLOSS, E. A. 635.64:575.172-181.13
Cell lengths in the terminal meristematic region of the stem as related to tallness and dwarfness.
 Amer. J. Bot. 1940 : 27 : No. 10 Suppl. : p. 2s. (Abst.).

Comparison of cell lengths at the apex of the stem in tall and dwarf tomatoes failed to show any difference in the early stages of elongation. It is suggested that in the dwarf the cells stop elongating earlier.

492. LESLEY, M. M. and
 LESLEY, J. W. 635.64:576.356.4:581.163
Parthenocarp in a deficient tomato plant and in its aneuploid progeny.
 Genetics 1941 : 26 : 159-60. (Abst.).

A very small tomato plant was found to be a deficiency heterozygote, about one third of a chromosome being deficient. Its offspring included several types of trisomics. The deficient plant and all its aneuploid derivatives showed a tendency to parthenocarp. It is suggested that gene balance in the whole chromosome and especially in the deficient chromosome tends to increase auxin production and so favours parthenocarp.

493. DASKALOV, K. 635.646:575.125
[Contribution to the study of heterosis in the egg plant (*Sol. melongena* L.) and the possibility of its practical utilization in horticulture].
 Rev. Inst. Rech. Agron. Bulg. 1937 : 7 (4) : 57-76.

The occurrence of heterosis in the egg plant having been demonstrated by experiments in

1934, a more extensive study was made in 1936 and 1937 with suitable local and foreign varieties from the collection at the Plovdiv Agricultural Experiment Station.

Investigation of the biology of flowering showed that under the conditions at the Station self-pollination predominated, though at the same time 30-40% of cross-pollination was recorded. Obligatory self-pollination induced by bagging invariably gave a set of 90-100%.

The best time for emasculation was found to be when the calyx was not yet unfolded or just unfolding. Emasculation then, followed by pollination two days later, gave a set of 70-80%. Heterosis was well marked in almost all the crosses. The increase in yield ranged in 1936 from 17.58 (for Pekin x Odessa) to 44.88% (for Odessa x Ed'r čer) and in 1937 from 10.06% to 43.39%. The average increase for all crosses was 27.65% in 1936 and 21.7% in 1937. Only one cross Violet x Local variety showed a decrease, 15.9%.

Differences in the degree of heterosis in 1936 and 1937 are attributed to differences in varietal reactions to variation in the weather conditions in the two years.

The fact that heterosis appears to be more marked in the initial stage of development and fruiting than at a later stage (the differences between the F_1 and the parent forms being eliminated as the vegetative period proceeds) should prove a useful factor in selection.

Almost all the crosses also surpassed their respective parents in earliness, this being specially clearly seen in Delikatess x Bucharest, Jambolski x Delikatess, Odessa x Violet, Odessa x Ed'r čer and Pekin x Odessa—all of which showed pronounced transgression in F_1 .

The most interesting crosses from the standpoint of heterosis in the F_1 and the possibility of its economic utilization were the following which are described in detail: Delikatess x Bucharest, Odessa x Ed'r čer, Odessa x Violet, Pekin x Odessa and Jambolski x Delikatess. They also possess greater vitality and general resistance to unfavourable environmental conditions, to shedding in particular.

The fruits of the first three crosses are deficient in gloss—a defect which also appears in crosses comprising Violet and Delikatess—but this could be corrected by using suitable combinations. The methods used in raising the seed and plants and in the statistical evaluation of the results are described.

The production of enough "heterosis" seed to meet the requirements of practical horticulturists in Bulgaria could be relatively easily achieved.

494. MARSHAK, A. 635.651:576.356:539.185.9
Chromosome abnormalities produced in interphase nuclei with X-rays and neutrons.
 Genetics 1941 : 26 : p. 161. (Abst.).

Abnormalities at anaphase after neutron bombardment were found to vary exponentially with the dose in root tips of *Vicia Faba*, *Pisum* and *Allium*.

495. HABER, E. S. 635.67:575.125:576.16
Sweet corn hybrids.
 Bull. Ia Agric. Exp. Sta. 1940 : No. P15 (N.S.) : 436-68.

Descriptions of commercial hybrids tested and adapted to Iowa are given. It has been definitely established that good hybrid sweet corn strains will yield more than open-pollinated varieties. Of more importance to the canner (about 95% of sweet corn grown in the U.S.A. is used for canning) than increased yields is the increased uniformity in maturity, size of ear and height of ear placement on stalks found in hybrids. All sweet corn hybrids developed at the Iowa Agricultural Experiment Station bear the prefix "Io" - thus the names Iogent, Iogreen and Iogold are obtained for hybrids of the Country Gentlemen, Evergreen and Golden types respectively.

496. GAESSLER, W. G.,
 HIXON, R. M. and
 HABER, E. S. 635.67:581.6
The quantity of pericarp in several hybrid and inbred strains of sweet corn.
 Iowa St. Coll. J. Sci. 1940 : 14 : 379-83.

It was found that the inbred and hybrid strains studied differed in the percentage of pericarp present at the canning stage and that those classed as very tough on chewing contain from 50 to 100 per cent. more pericarp than those classed as tender.

BOOK REVIEWS

BRINTON, W. C.

003.63

Graphic presentation.

Brinton Associates, N.Y. 1939: Pp. 512. illus.

"Graphic presentation" is very widely used—thus simple graphs and bar charts may be found in both scientific papers and patent medicine advertisements and we are all familiar with the use of dot and pin maps or of contour maps, showing mean temperatures, rainfall, etc. as well as height, in geography textbooks and atlases. Another common use of graphic presentation is the sector chart and in the present book other forms of charts and maps such as organization, flow, relationship, pictorial unit bar and "Z" charts and guide and route, crosshatched and coloured, flow and distorted maps are illustrated and discussed. Suggestions for making charts are given and there are also details of the apparatus required and how to use it. Quantitative cartoons form another part of the book. There is a section on "Displays and Exhibits" and the whole book would be very useful for plant breeders and agriculturalists to refer to when they are preparing both popular and scientific demonstrations. It is also just possible that plant breeders might profit from studying the sections on flow, organization and relationship charts, for it is stated in the preface that graphical representation has been used to solve such problems as "control methods for quicker 'turn-arounds' of eighty-five ships", "strategy in the president's office of a steel company with twenty thousand employees" and "scheduling . . . two thousand tool makers scattered in shops throughout New England to assist in producing the light Browning machine gun by a company already working twenty-two thousand employees". The book also contains some information on the production, writing and binding of books and there are very short sections on methods of reproducing such as the gelatine process and mimeograph machines. The production is distinctive.

NICOL, H.

577.17:581.14:581.04

Plant growth-substances. Their chemistry and applications, with special reference to synthetics.

Leonard Hill, Ltd., London 1940: 7s. 6d. 2nd ed. Pp. xii + 148. 6 figs.

The first edition of this book was reviewed in "Plant Breeding Abstracts", Vol. IX, p. 144. The second edition follows similar lines, but the material has been rearranged and brought up to date. It is not entirely clear whether this edition is like the first "written for chemists" or is intended for a wider public; it certainly contains material which would normally be included under the heading of plant physiology. In view of the author's fierceness towards reviewers expressed in the preface (which appears as chapter III) the present reviewer must leave it to bolder spirits to risk an appraisal. We shall say no more than that the author has his own ideas on how to plan a book.

THOMAS, M.

581.1

Plant physiology.

J. & A. Churchill, Ltd., London 1940: 21s. 0d. 2nd ed. Pp. xii + 596. 61 illus.

The first edition of this book appeared in 1935 and its merits were shown by the fact that it was reprinted in 1937. This second edition is about one hundred pages longer than the first and the number of references in the bibliography has been increased from 163 to 273. It can be fairly asserted that Meirion Thomas's book is as good as, if not better than, any of the rather numerous textbooks of plant physiology which have appeared since the first edition of his work.

The author has not attempted to cover the whole of plant physiology, the most obvious omission being the physiology of development—neither photoperiodism nor vernalization occurs in the subject index. On the other hand many branches of the subject are treated in more detail than is usually found in textbooks of a similar size. The various topics are considered chiefly in terms of physico-chemical concepts and the biochemical aspects receive particular attention. One feature of the book which recommends it to the advanced student and to the research worker in other branches of botany is the many references to other textbooks and to reviews and monographs on particular parts of plant physiology. The subject index also appears to be comprehensive enough to be really useful. Modern developments in plant physiology, e.g. growth substances, have often been included and it is interesting to

note that the importance for the theories of the ascent of sap of White's recent work on the root-pressures which can be developed by excised root-tips growing in culture is recognized. There are two appendices, one of 64 pages deals with those organic compounds of importance in plant physiology and the other with physical chemistry. A bibliography, a subject index and an author index complete this useful work.

TOTHILL, J. D. (Editor)

63(67.61)

Agriculture in Uganda.

575:633(67.61)

Oxford University Press 1940: 20s. 0d. Pp. xvi + 551. 30 pls. 9 figs. maps and charts.

The staff of the Uganda Department of Agriculture has rendered a valuable service to agriculturists in Uganda and in tropical countries in general by the production of this excellent handbook. According to the introduction it "endeavours to describe the state of agricultural knowledge and advancement in 1937" and it should be added that it gives also a thorough account of local conditions and practice.

The book is divided into sections, the first being a short introduction followed by a long section on general agriculture, with chapters on topography and vegetation, climate, native agriculture, soils, erosion problems and manures. There is a short section on experiment stations and farms and the next four sections deal with native food crops, namely bananas, sweet potatoes, cassava, yams, bulo (*Eleusine coracana*), maize, sorghum, bulrush millet, rice, wheat, groundnuts, simsim and pulse crops. Attention is then turned to cash crops, with sections on cotton, Robusta coffee, Arabica coffee, sugar cane, tobacco and plantation crops (cacao, rubber, tea). The remaining sections deal respectively with oil plants, spices and drugs, fibres, cover-crops and shade trees, fruits and vegetables, grasses and weeds, bees and locusts, marketing, and agricultural education and extension work.

There is a considerable space devoted to plant breeding work under different crops, an especially full account being given of cotton breeding activities past and present. Included in a general description these accounts have a special interest in that their relation to other research activities and to practice is made evident.

The book is handsomely produced and well illustrated by excellent photographs and useful maps. A general index and an index to scientific names are provided, but there is no bibliography. The different chapters are individually attributed to their respective authors but no list is given to show what posts they hold in the Department of Agriculture.

LARGE, E. C.

632.4

The advance of the fungi.

Jonathan Cape, London 1940: 18s. 0d. Pp. 488. 6 pls. 58 figs.

A history of plant pathology has been written, and written by a chemist! Mr. Large's interest in the subject has probably originated from his work on fungicides. His command of language is well shown in this book, and is not surprising in that he has also written two novels of merit. His style is easy and graceful, and has made this book eminently readable.

The book traces the development of the theory of disease, and the methods of combating it from the early years of the nineteenth century. The principal topic is the disease known now as potato blight but described a century ago as the potato murrain. The stories of the epidemics of the powdery mildew of the vine, the black stem rust of wheat, coffee rust and bunt in wheat are neatly dovetailed in the completed history, as well as most of the other well-known outbreaks. The part which these epidemics have played in the elucidation of the nature of disease, as well as the development of plant protection methods are fully described. At times the author attributes to workers ideas which subsequent investigations have proved to be correct. It may be that such prescience cannot be determined from the textual evidence, but the standard of technical accuracy in factual description is such as to allow the author the use of a little "local colour" in his speculative periods.

Anyone who has read the spate of letters published by the *Gardener's Chronicle* on the potato murrain in 1845-46 must have been impressed by the virility and resource displayed by the authors. Mr. Large has appreciated this quality in the gardeners and others of those days, just as he has caught the feelings engendered by the controversies with W. G. Smith as principal protagonist towards the end of the century. In short he has achieved a book which will be a necessity to the academic and practising pathologist and a delight to all who take an interest in living things.

S. D.

WARREN, C. H.

633.1(42)

Corn country.

B. T. Batsford, Ltd., London 1940: 10s. 6d. Pp. viii + 136. 51 pls.

This is a popular and well-illustrated account of corn growing in England with special attention to such aspects as the folk-lore and customs associated with it. The book is divided into three parts, the first being historical, the second giving an account of the work associated with the four seasons of the year, while the third is political. A brief list of books and an index are provided.

633.912:581.165.1:582(92.2)

Identificatiekenmerken van de voornaamste in de praktijk aangeplante *Hevea*-cloonen. (**Distinctive characteristics of the main *Hevea* clones grown by planters**).

Archipel Drukk, Buitenzorg 1939: Pp. 216. illus.

To meet the needs of rubber planters it was decided in 1938 to issue an illustrated book embodying descriptions of all clones that have been recommended in the course of years by the various experiment stations in Java.

An introduction is provided which summarizes the information on methods of identification of clones on the basis of (1) morphological features and (2) the latex reaction.

The format resembles the loose leaf system adopted for a similar publication by the Rubber Institute of Malaya and admits of the addition of supplementary information on new clones whenever necessary. The main portion of the book, including the drawings illustrating the various clones, has been printed on strong, damp-proof paper and is interspersed with blank pages for notes.

An appendix comprises numerous photographs of the leaf types characteristic of various clones.

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